Vol. 24 MAY, 1904 No. 141

THE FOUNDRY

PUBLISHED MONTHLY BY
THE IRON AND STEEL PRESS CO.
CLEVELAND OHIO

ESTABLISHED 1874

"The Best is the Cheapest"

There is no motto which applies better to

Foundry Facings and Blackings

No. 702 Pure Ceylon Plumbago
Reliance Blacking
"Esso" Plumbago Core Wash
Cream Talc
Special Brass Facings
Peerless Steel Facings
Sea Coal or Bituminous Facings

Manufactured exclusively by

THE S. OBERMAYER CO.

Cincinnati Chicago Pittsburg

WE are the largest manufacturers of Foundry Facings and Blackings in the world. Capacity of our three plants OVER ONE HUNDRED TONS PER DAY.

ESTABLISHED
1874

Now is the Time to Save and Make Your Foundry Profitable

You can do this by adopting all

MODERN AND UP-TO-DATE LABOR SAVING DEVICES USED IN HANDLING AND MELTING OF METALS

These are fully illustrated in our

GENERAL CATALOGUE No. 40 A

just published and ready for distribution and sent on request with express charges prepaid to any foundryman in the world

THE S. OBERMAYER CO.

CINCINNATI, O.
CHICAGO, ILL.
PITTSBURG, PA.

Cable Address: "Esso" Cincinnati, O., U.S.A. A. B. C. Code

"Everything You Need in Your Foundry"

NEW

Paxson-Colliau Cupola

The more you examine it, the better you will like it . . . . . .

The Acme of Science in Cupola Construction . .

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

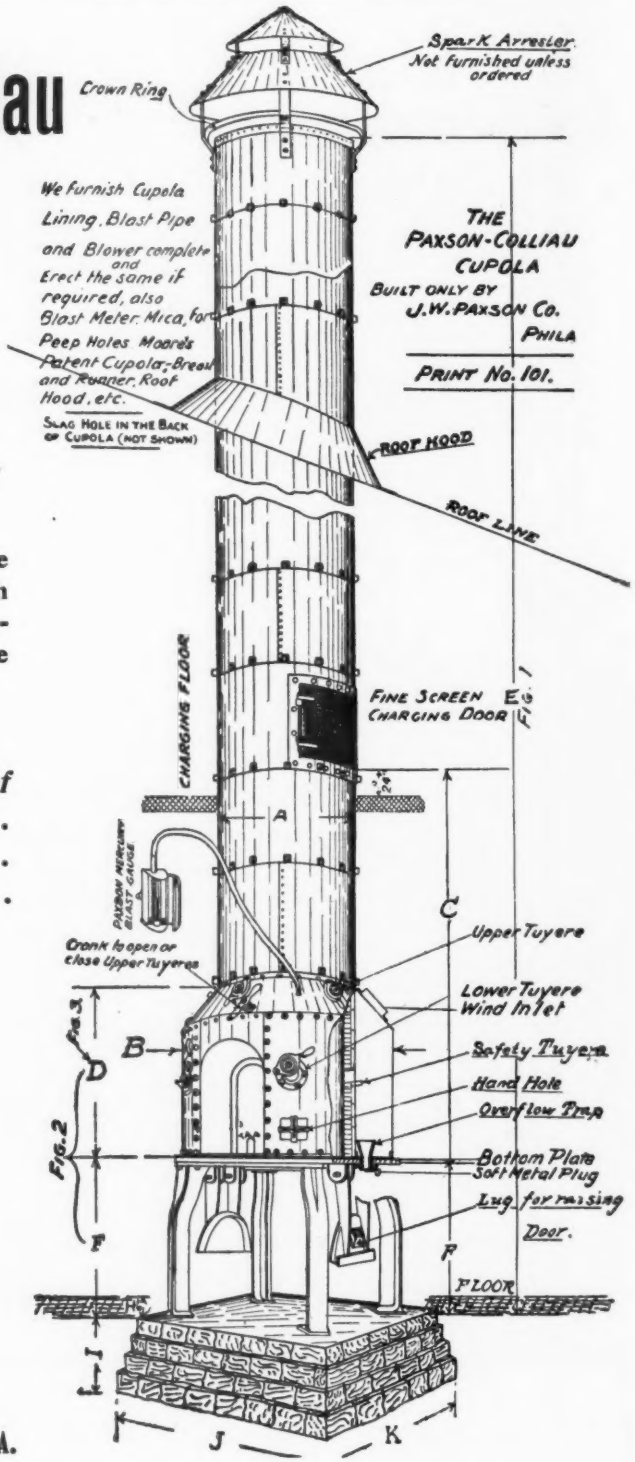
Location and area of tuyeres insure the . . highest melting . . . . efficiency . . . . . .

It keeps us hustling to fill the orders for these goods.

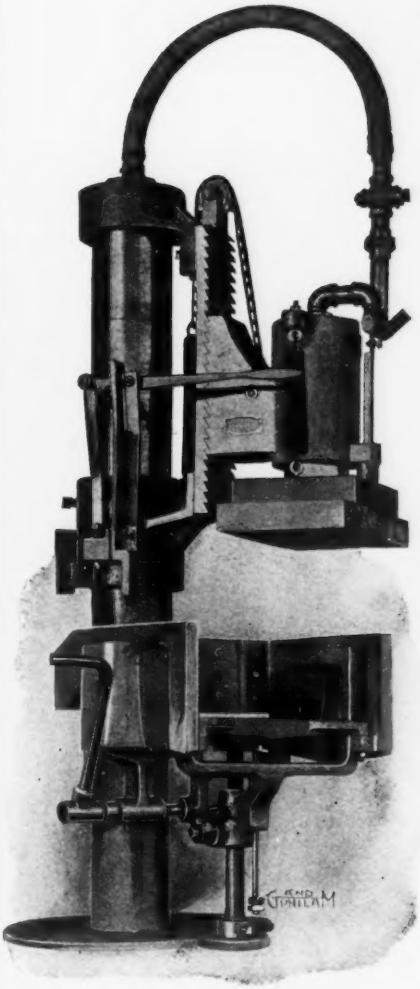
MADE ONLY BY THE

J. W. Paxson Co.

1021 . . .
North Delaware Avenue,
PHILADELPHIA, PA., - U. S. A.



J. W. Paxson Co.



IN the next issue of this Journal an improvement in PAXSON - HALL Molding Machine will be illustrated.

—

We solicit inquiries, and a visit to our works where they may be seen in operation daily.

Taking less floor space, and having an automatic air supply valve, to prevent accident to operator and mold are two of many points of merit.

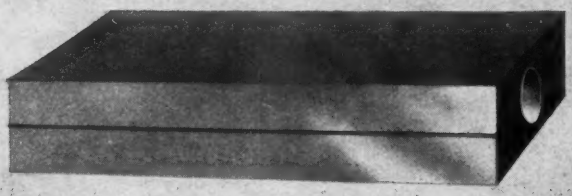
OPERATED
BY
COMPRESSED AIR

Our Stock of "Every-Thing You Need" to equip your Foundry is replete and up-to-date.

PHILADELPHIA, PA.

PERFECTION CORE BOXES

PATENTED



FOR ACCURATE STRAIGHT ROUND

CORES

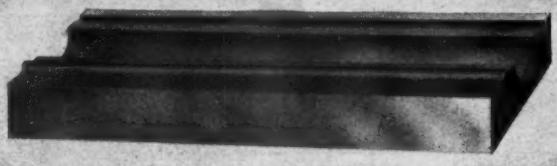
FROM ½" TO 6½" IN DIAMETER

ANY LENGTH DESIRED

MOST DURABLE & ACCURATE BOX MADE

HAS NO EQUAL

NO DOWEL PINS TO BREAK OFF



SEND FOR DESCRIPTIVE PAMPHLET

THE J·D·SMITH FOUNDRY SUPPLY CO.

SOLE MANUFACTURERS

CLEVELAND, O.

OUR REPUTATION FOUNDED ON MERIT, NOT AGE

We claim to make the BEST PLUMBAGO, FOUNDRY FACINGS and SUPPLIES produced in the United States today. This is a BROAD statement, but the truth permits of no qualifications; we either DO or we DON'T.

YOU WANT THE BEST

We honestly believe that our goods are SUPERIOR to those you are now using. We want you to know this, you to be the judge and decide upon the merits of our claim, after a thorough trial in your own shop on your own work.

Ground Goods

PLUMBAGO
INDIA SILVER LEAD
GRAPHITE
FOUNDERS' PERFECT WASH
CORE WASH
HEAVY MACHINE FACING
RHODE ISLAND FACING
HEAVY STOVE-PLATE FACING
RETURN FACING
CHARCOAL FACING
INGOT MOLD WASH
XXX MINERAL FACING
SOAPSTONE OR TALC
COKE BLACKING
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BOLTED CEMENT
SEA OR STONECOAL

The Hill & Griffith Co.

Cincinnati, Ohio, U.S.A.

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SHOVELS
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WHEELBARROWS
HAND AND POWER SAND SIFTERS
BRUSHES
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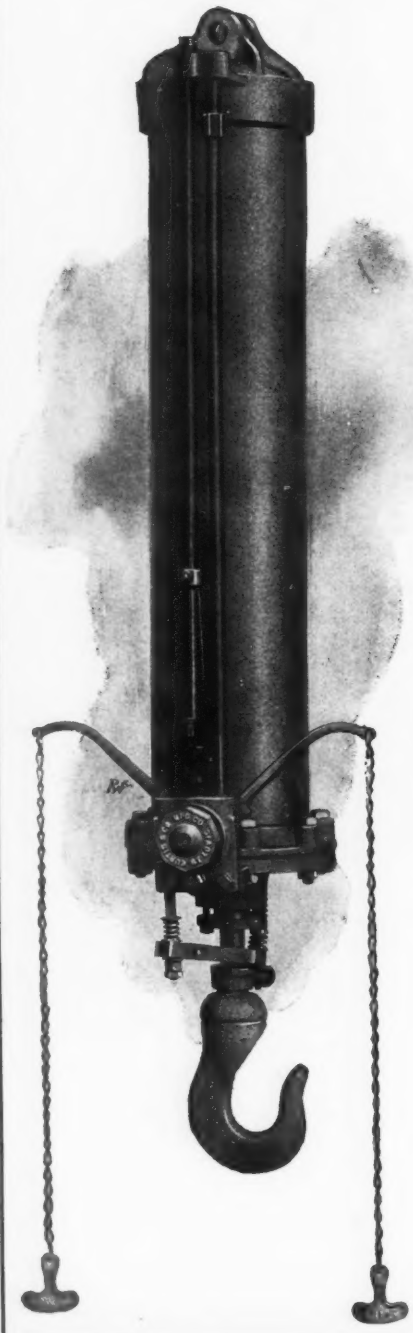
PATTERN LETTERS
FOUNDRY TORCHES
SNAP FLASKS
FOUNDRY BUCKETS
MALLETS
"SMOOTH-ON" IRON CEMENT
CRUCIBLES AND BRASS FOUNDERS' SUPPLIES

We have the courage of our convictions—what we want you to do is to give the goods a trial, and if, after the test is made, you do not agree with us, we will charge you nothing for the goods, but will expense the cost to over-confidence.

WE SELL THE BEST

Please bear in mind, our prices are no higher than you are paying. We ask for your patronage on the basis of giving you a BETTER value for the SAME money. It's only the first order we are asking for. You will send the others.

The CURTIS HOIST



AIR BALANCED

NO JUMP
OR JERK

Will Handle the Most Difficult Moulding

Made in sizes from 3″ diameter 450 lb capacity, to 19″ diameter 20,000 lb capacity.

PNEUMATIC ELEVATORS
AIR COMPRESSORS
OVERHEAD TROLLEY SYSTEMS

Manufactured by

Curtis & Co. Mfg. Co.

ST. LOUIS

Baird Machinery Co.,	Pittsburg
Strong, Carlisle & Hammond Co.,	Cleveland
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Are You Using Our

VULCAN BLACKING

FOR DRY SAND AND LOAM WORK?

If not

TRY A BARREL OF IT

and you will use no other

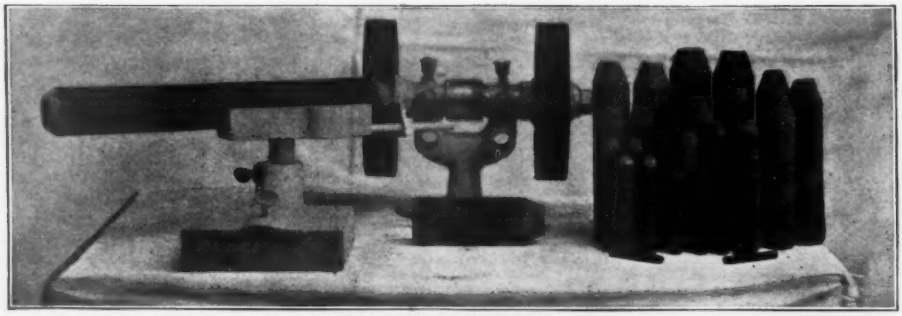
❡ The name VULCAN is our REGISTERED TRADE MARK and we warn manufacturers from using this name and others against purchasing any Blacking or Facing not sold by us, having this brand.

Foundry Supply Depot

J. S. McCORMICK CO.

PITTSBURG, PA.

Ten Times Stronger Than Hand-Made Cores and Vented End to End.



Grinder For Coning Cores.

THE WADSWORTH Improved Stock and Standard Core Machine

makes sizes ⅜ to 6 inclusive. A 6 in. diameter core 24 inches long in 15 seconds, 200 to 600 ft. of cores per hour or 2,000 to 6,000 feet per day.

PATENTED JANUARY, 1902

OTHER PATENTS PENDING

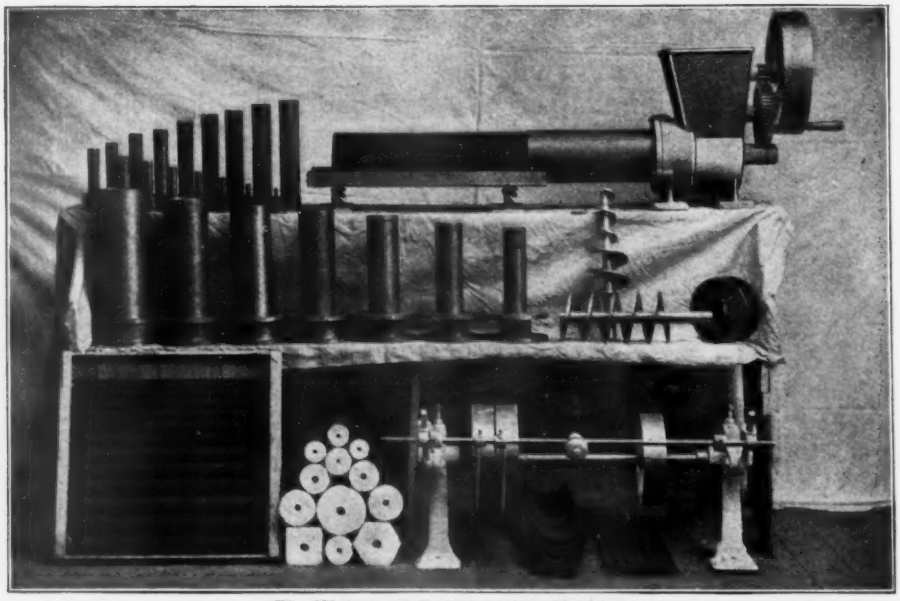
The stock cores are made in 24 in. lengths, baked, and coned with a special attachment, any length and any taper. All cores vented end to end.

We are pioneers in the Core Machine Business and Core Machine Specialists

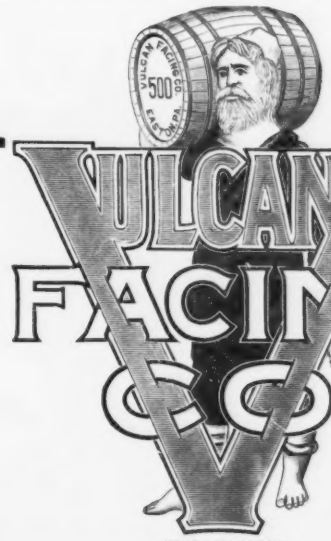
THE FALLS RIVET & MACHINE CO.

CUYAHOGA FALLS, OHIO, U.S.A.

Better Cores For Less Money.



The Wadsworth Improved Core Machine.



TRADE MARK.

Our Dry Sand Blacking

The Standard of Foundry Excellence

WHEN you use our DRY SAND BLACKING no time is wasted in investigation or experiment. The article is the result of a series of tests undertaken to find the best article obtainable for FOUNDRY FACING and the result gives us a blacking of the highest economic practical value. Anything having to do with the blackings or leads applied to mold dressing is directly of interest to us, for we deal exclusively in FOUNDRY FACINGS; make it our study and business. We could not afford to carry anything but strictly reliable goods and we are willing to send them on approval to be paid for when satisfactorily demonstrated their worth.

THE OLD WAY was to let the cleaning department scrape and wire brush castings. THE NEW WAY is to have all this done, and well done by the molder when he applies VULCAN BLACKINGS to the mold.

Insure yourself against defective castings, due to surface dirt, by using blackings for your moulds that are faithfully standing severe tests daily in many of the leading foundries and use the goods with the VULCAN stamp. It is a standard guarantee of material embracing every desirable merit necessary in facings in foundry practice.

For sale in Car Lots or smaller quantities

CEYLON, GERMAN AND AMERICAN GRAPHITES
Always on hand ready for immediate shipment in car lots

ANTHRACITE BLACKING FOR PIPE FOUNDRIES

SEA COAL FACING in bags or barrels

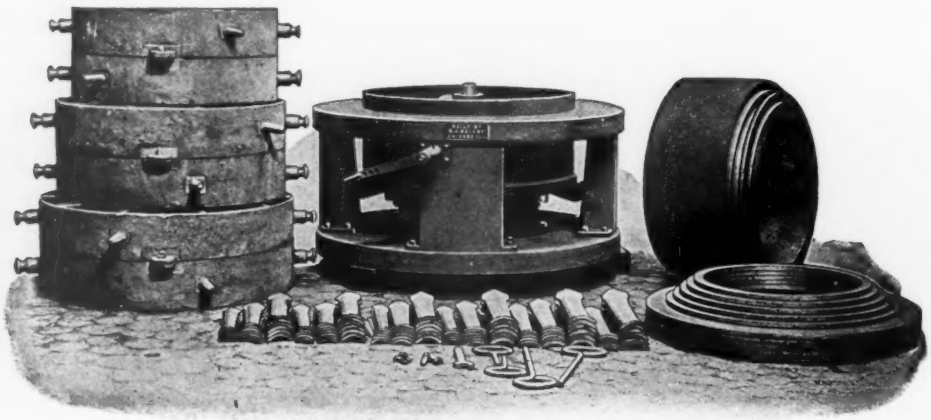
Give us a trial order

Our prices are so low and our deliveries so prompt we will surprise you

VULCAN FACING CO. **Easton, Pa.**

Pulley Moulding MACHINERY

Built by THE E. A. DELANO CO. **50 to 56 S. Clinton St., Chicago, Ill.**



The above cut shows our No. 3 Pulley Moulding Machine with a complete equipment for making all sizes of iron pulleys from 26 in. to 36 in. diameter and any face. We make machines to cast any size and description of iron pulleys between 3 in. and 72 in. Our catalogue P. M.-1 is yours for the asking.

A Partial List of Representative Users of these Machines.

Allis-Chalmers Co., Milwaukee, Wis.
The Jeffrey Mfg. Co., Columbus, Ohio.
Allis-Chalmers Co., Chicago, Ill.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Fraser & Chalmers, London, England.
Golden's Fdy. & Machine Co., Columbus, Ga.
Webster Mfg. Co., Chicago, Ill.
Woonsocket Machine & Press Co., Woonsocket, R. I.
Lane Mfg. Co., Montpelier, Vt.
Franklin Machine Co., Providence, R. I.
James Frake, Chicago, Ill.
Baush Machine Tool Co., Springfield, Mass.
Pratt & Whitney, Hartford, Conn.
Pyott Fdy. Co., Chicago, Ill.
Crowell Clutch & Pulley Co., Westfield, N. Y.
Clark Bros., Belmont, N. Y.
Henry Roos Foundry Co., Chicago, Ill.
Naylor Bros., Peekskill, N. Y.
Meese & Gottfried, San Francisco, Cal.
Avondale Stove & Foundry Co., Birmingham, Ala.
H. N. Strait Mfg. Co., Kansas City, Kan.
W. E. Caldwell Co., Louisville, Ky.
Samuel C. Tatum Co., Cincinnati, Ohio.
D. J. Murray Mfg. Co., Wausau, Wis.
Wheelands Machine Works, Chattanooga, Tenn.
Co-operative Foundry Co., Detroit, Mich.
Lombard Iron Works & Supply Co., Augusta, Ga.
Geo. V. Cresson, Philadelphia, Pa.
Bates Machine Co., Joliet, Ill.
A. & F. Brown Co., New York City.
W. A. Jones Fdy. & Machine Co., Chicago, Ill.
Holyoke Machine Co., Worcester, Mass.
Erie City Iron Wks., Erie, Pa.
Continental Gin Co., Prattville, Ala.
Henry Vogt Machine Co., Louisville, Ky.
Link Belt Machinery Co., Chicago, Ill.
Aurora Foundry Co., Aurora, Ill.
W. T. Eaton Mfg. Co., Libertyville, Ill.
Standard Pulley Mfg. Co., New Orleans, La.
The National Machinery Co., Tiffin, Ohio.
De Loach Mill Mfg. Co., Atlanta, Ga.
Utica Steam Engine & Boiler Works, Utica, N. Y.
Willamette Iron & Steel Wks., Portland, Ore.
Dodge Mfg. Co., Toronto, Canada.
Colorado Iron Wks., Denver, Col.
Huntley Mfg. Co., Silver Creek, N. Y.
R. Hoe & Co., New York City.
Builders Iron Foundry, Providence, R. I.
Southern Engine & Boiler Wks., Jackson, Tenn.
Deane Steam Pump Co., Holyoke, Mass.
Kay-Pim Mfg. Co., St. Louis, Mo.
Richmond City Mill Wks., Richmond, Ind.
The Central Fdy. Co., Hamilton, Ohio.
The Wolf Co., Chambersburg, Pa.
Olympic Fdy. Co., Seattle, Wash.
Garden City Fan Co., Niles, Mich.
Mobile Stove Works, Mobile, Ala.

Agents for Great Britain: J. W. JACKMAN & CO., 39 Victoria St., London.

THE

PRIDMORE

IS THE ONLY

MOLDING MACHINE

BUILT ON THE

RIGHT PRINCIPLE

It is Simple,
Substantial
and Efficient

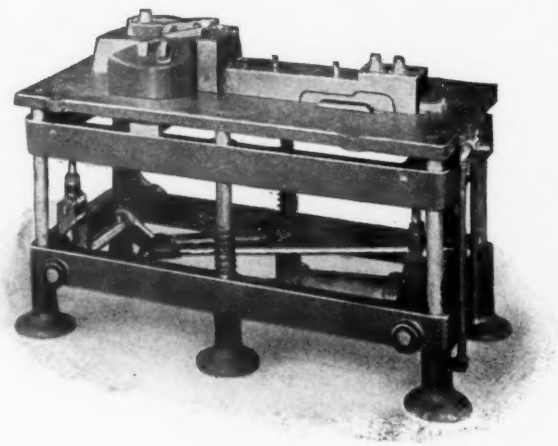
MANUFACTURED BY

HENRY E. PRIDMORE

CHICAGO

Are You in the Ox Wagon?

If BEN HUR had driven an Ox Wagon in his celebrated race, he could hardly have expected to win. Yet *Ox Wagon Methods Prevail* in many foundries today, and in the race for profitable business, many foundrymen are losing ground.



Maywood Molding Machines

will help you to make money on jobs that must be taken at close prices on account of competition. Of course, there are other machines but none better than the MAYWOOD. :: :: :: :: ::

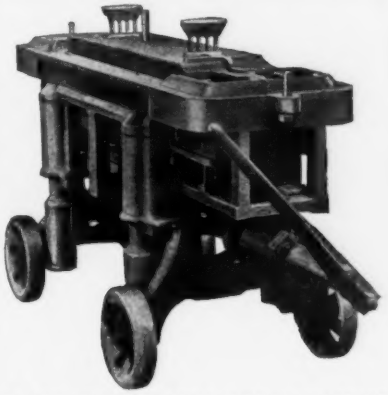
Because

Simplest in construction
Easiest to operate or change patterns
Most accurate in alignment
Most perfect in adjustment

Write today for particulars

Maywood Foundry & Machine Company

1606 Tribune Bldg., Chicago



DRAPER-TABOR HAND RAMMING MACHINE
A PLAIN STRIPPING PLATE MACHINE
—WITH A VIBRATOR IF YOU WANT IT

A PARTIAL LIST OF THE DIFFERENT MACHINES WE MANUFACTURE:

Hand Ramming Split Pattern Machines
Hand Ramming Stripping Plate Machines
Hand Ramming Vibrator Frame Machines
Foot Pressure Core Machines

(THOMAS-CLAIRE PATENT)
VERY FAST

MOLDING MACHINES

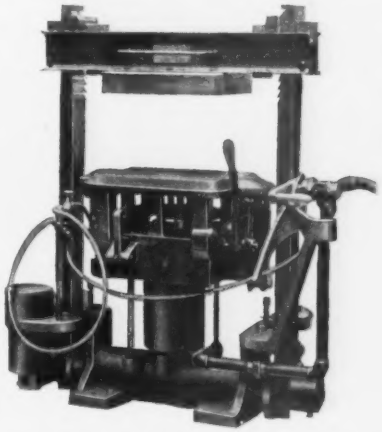
Power Ramming Split Pattern Machines

Power Ramming Stripping Plate Machines

Power Ramming Vibrator Frame Machines

Power Ramming "Squeezers"

Power Ramming Machines for deep work on which no hand work is necessary regardless of depth. Power Ramming Machines for very large work in flasks 34" x 42" to 40" x 90" for Steel Castings, TUNNEL PLATE SEGMENTS, etc.



LIGHT POWER RAMMING SPLIT PATTERN
VIBRATOR MACHINE WITH HAND DRAFT

The Tabor Manufacturing Company

18th and Hamilton Streets, Philadelphia, Pa.

Chicago Office
30 and 32 S. Canal Street

Fenwick Freres
Paris

Schuchardt & Schutte, Berlin

49, Deansgate
Manchester, England

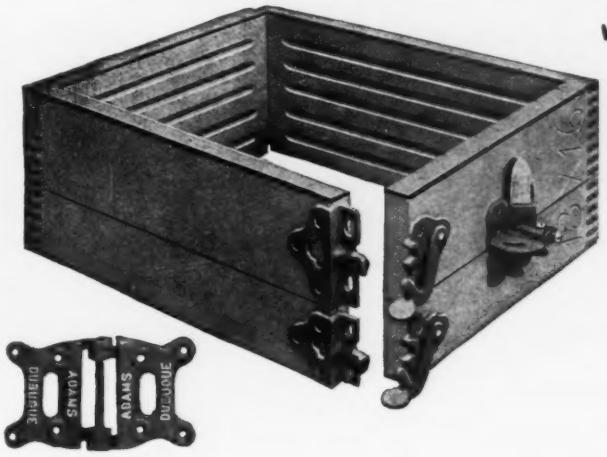
MOLDING MACHINES

Send for Catalog No. 9

The Adams Company,

J. W. Jackman & Co., London, S. W., England
H. Glaenzer & Perreaud, Paris, France
V. Lowener, Copenhagen, Denmark

The Adams Cherry Snap Flask



Selected Dry Cherry

1 1-16 inches thick, is used in our flasks which alone costs more than all of the material used in the ordinary flask.

Corners

of the flask are machine locked, giving greater surface for gluing and a stronger joint than is possible to obtain from a dovetail or mitre.

Top Irons

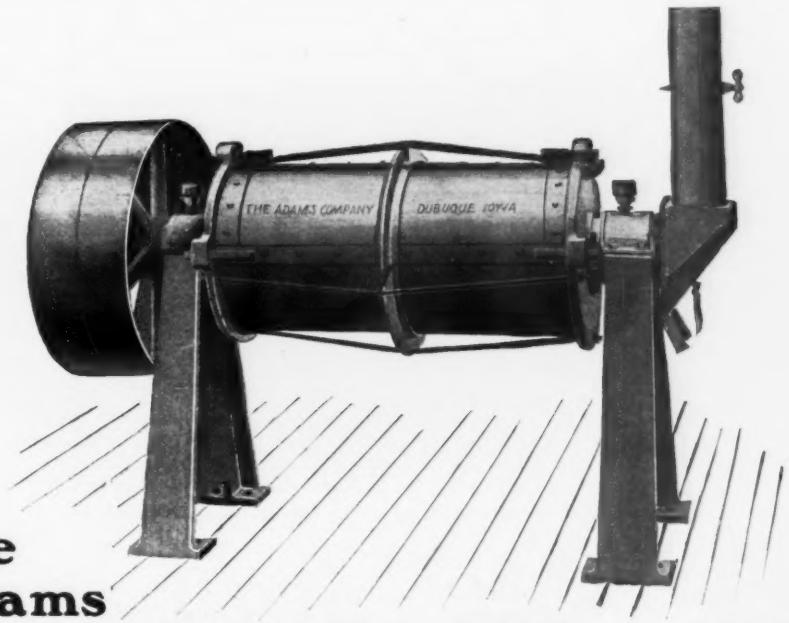
which protect the edges of both cope and drag are $\frac{1}{8}$ x 1 inch wrought iron with WELDED CORNERS, which make the flask more rigid.

Trimmings

are of malleable iron. The snaps are without doubt the quickest snaps to operate.

Pins and Ears

of malleable iron, have ¾ inch milled bearing on each side of the right angle. Fine adjustment in both ears is provided for by means of a screw on the ends of the ears. Both ears being adjustable, cope and drag are easily kept in line.



The Adams Exhaust Tumbling Mill

Send for Catalog No. 8

Dubuque, Iowa, U. S. A.

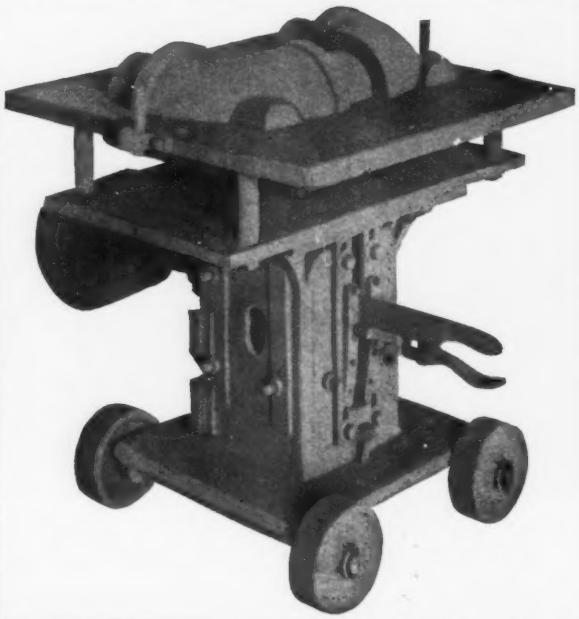
Ing. G. Pontremoli & Co., Milan, Italy
Wynmalen & Hausman, Rotterdam, Netherlands

THE MOLDING MACHINE

NO FAD *but a* MATTER *of* ECONOMY

TO THE INTELLIGENT FOUNDRYMAN

Are you in this class, Mr. Proprietor, or Foreman?
If so, you ought to be using this machine.



IT IS

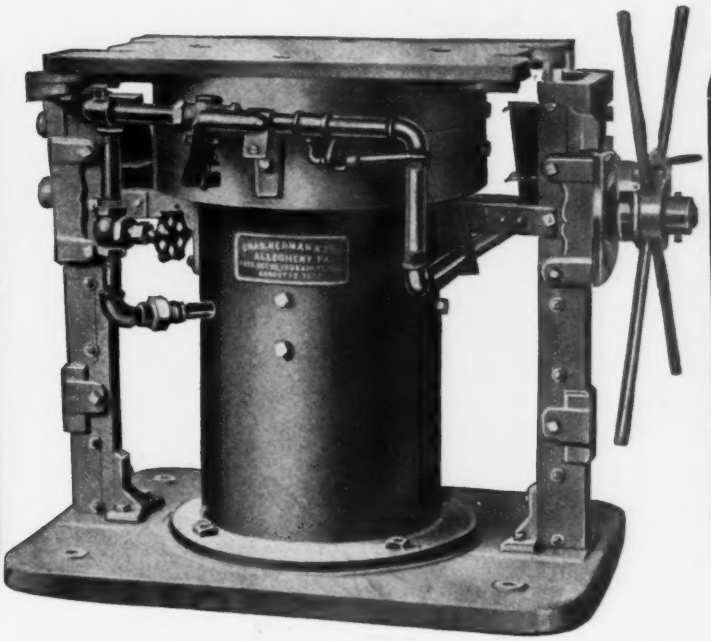
SIMPLE
EASILY ADJUSTED
NEVER BURDENED WITH A BILL OF REPAIRS
A MONEY MAKER

TAYLOR, WILSON & CO., LIMITED

102 GRANT AVENUE ALLEGHENY, PA.

The Deeper the Flask The Greater the Gain

Herman Pneumatic Jarring Molding Machine



When machine is installed it is not necessary to wait until stripping plates and interchangeable flasks are made.

Deep drag patterns, that you are using for floor work, may be placed on machine table, the machine does the ramming and the patterns are drawn by hand.

The machine jars or rams up a mold in a few seconds, makes a perfect mold and there is absolutely no blowing or scabbing.

The advantage over hand ramming alone is sufficient to pay the outlay for machine.

One of our customers says he is putting up a day's work the above way, in two hours.

When stripping plates are used, less operations are required and more molds can be turned out.

We lift stripping plates with air hoists attached to machine, requiring no hard work when there is a high lift, and the molds weigh from 200 to 1000 pounds.

WRITE FOR CATALOGUE

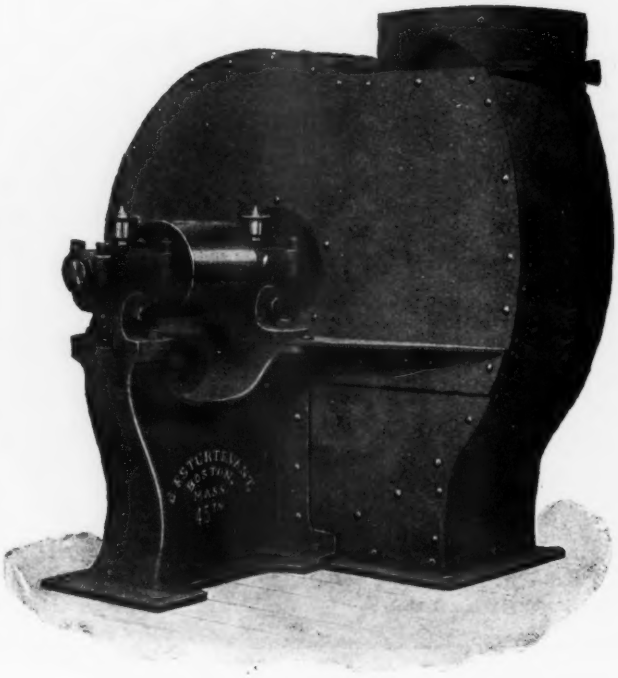
CHAS. HERMAN & SON

SHARPSBURG, PA.

Pneumatic Engineering Appliances Company, Ltd., Palace Chambers, Westminster, London, Eng., Foreign Representatives

STEEL PLATE
EXHAUSTERS

FOR TUMBLING BARRELS AND EMERY WHEELS



They keep the atmosphere clear and free from dust. Arranged to be driven by belt or by direct connected electric motor.

Send for Catalogue No. F 115

B. F. STURTEVANT CO.

BOSTON, MASS.

NEW YORK PHILADELPHIA CHICAGO LONDON

158

ROOTS'

Established 1859

POSITIVE PRESSURE BLOWER

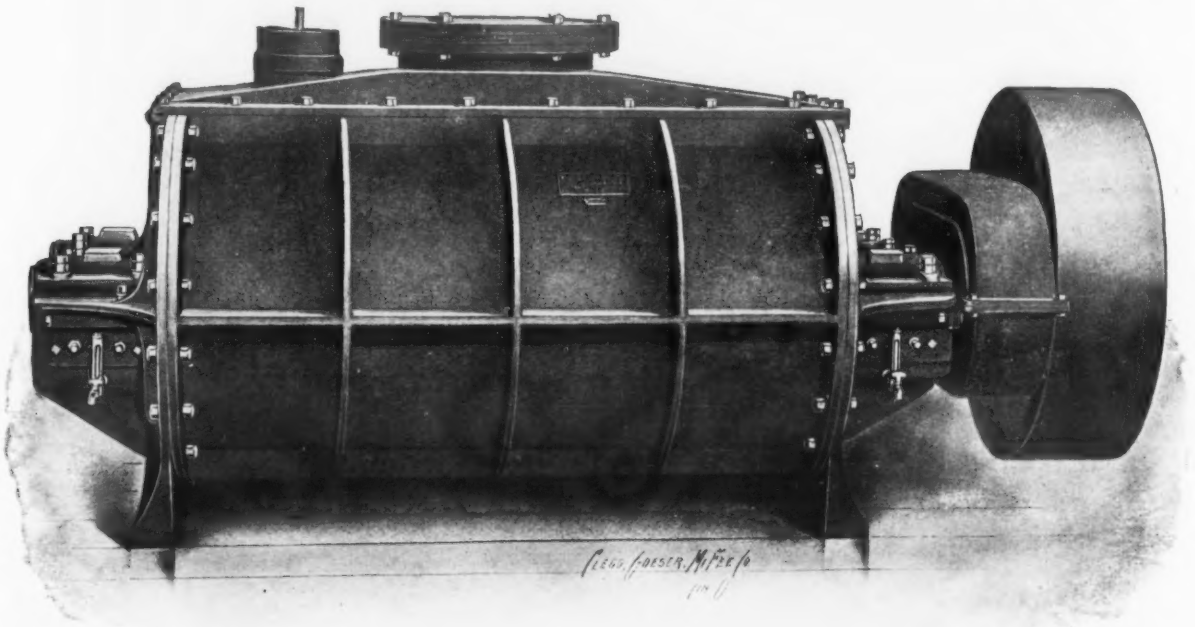
Judging from our orders, it is evident that foundrymen all over the country are convinced of the superior merits of Roots' Blowers.
Everything to gain, nothing to lose by using our Blowers.

P. H. & F. M. ROOTS CO.

Home Office and Works:
CONNERSVILLE, INDIANA, U. S. A.

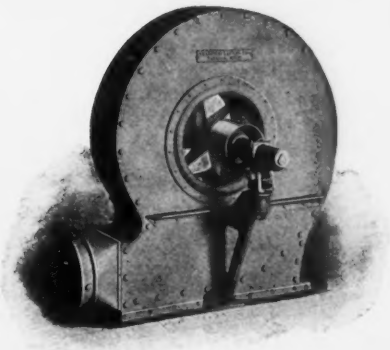
NEW YORK OFFICE,
120 and 122 Liberty St.

CHICAGO OFFICE,
1547 Marquette Bldg.



Our Latest Improved Foundry Blower.

"A B C"
HEATING · VENTILATING · DRYING
MECHANICAL DRAFT APPARATUS



CATALOGUES UPON REQUEST
AMERICAN
BLOWER CO.
DETROIT
NEW YORK CHICAGO LONDON

IT IS SAID An Ounce of Prevention is worth a Pound of Cure.

YET An Ounce of SMOOTH-ON often Saves when a Pound of Prevention Fails.

Before Using SMOOTH-ON Castings

After Using SMOOTH-ON Castings

Our SMOOTH-ON Preparations

are not fillers. Each one is made for use only under certain conditions.

Our SMOOTH-ON CASTINGS is made for the special purpose of repairing castings that are leaky under pressure or having sand holes or blow holes which affect their appearance only.

SMOOTH-ON here makes a permanent repair; in fact, the appearance of the casting in color and finish is the same as if it had been perfect at the start.

We also make SMOOTH-ON for the use of engineers and plumbers in repairing steam pipes, cylinders, radiators; in fact, anything of iron which is not perfect.

Our booklet of SMOOTH-ON Compounds should interest you. Write for it.

Meanwhile send for a small can and try its contents when you have trouble. You will soon send us a larger order when you know its good qualities.

Chicago Office, 61 N. Jefferson St. San Francisco Office, 61 Steuart St.

Agents for Great Britain, MESSRS. HODGSON HARTLEY LTD.
55 Victoria Buildings, Manchester, England.

The Smooth-On Mfg. Co.

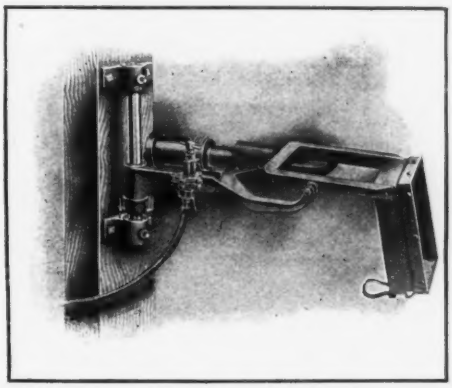
Analytical and Manufacturing Chemists

JERSEY CITY, N. J.

KEEP UP WITH THE TIMES AND EQUIP YOUR PNEUMATIC MOLDING MACHINE WITH A

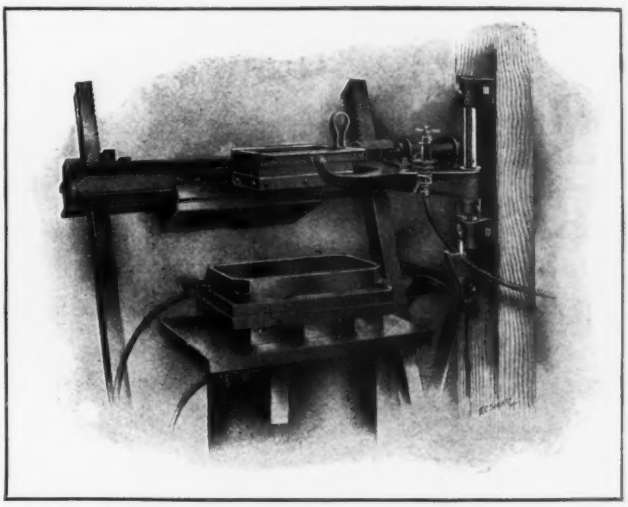
Hanna Swivel Post Shaker

Adjustable for Different Heights of Flasks



Provided with Removable Screens

Arranged to start automatically when shaker is swung into position for riddling, and stops when swung away.

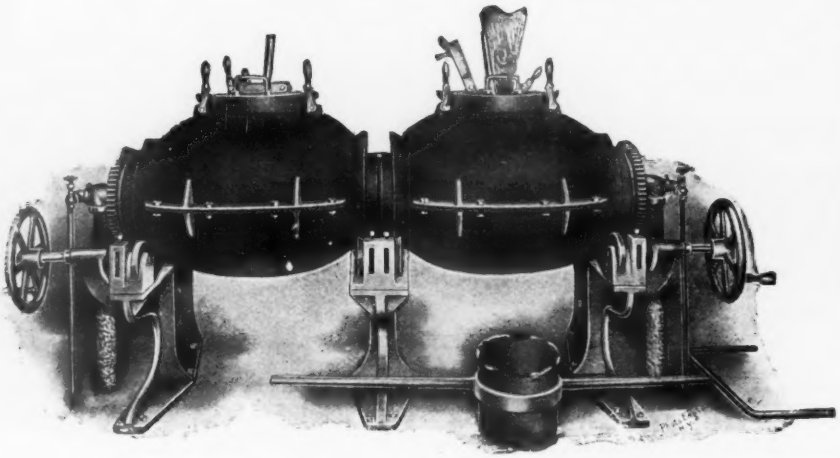


We make other styles of Shakers also. Write for particulars.

Hanna Engineering Works, 820 Elston Ave., CHICAGO

A Money Maker

for your foundry



ROCKWELL ROTARY MELTING FURNACE

This furnace utilizes the heat from the spent gases of combustion. Two kinds of metal can be melted at the same time or both chambers can be used for one kind. The lining is an inexpensive material rammed into the furnace shell in bulk and burned hard and refractory in place. Large output for floor space required. No complicated parts or expensive repairs. Oil or gas is used as fuel, and the air for combustion is supplied from an ordinary fan. For general convenience and cleanliness, it is unequaled.

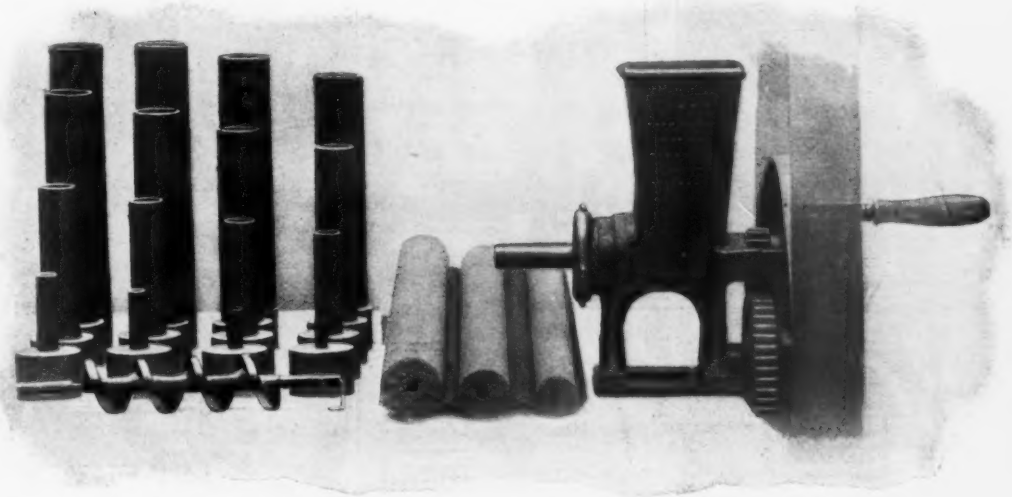
Made in four standard sizes ranging in capacity from 350 to 3,000 pounds each chamber.

ROCKWELL ENGINEERING COMPANY

26 CORTLANDT STREET

NEW YORK

ROUND, HEXAGON OR OVAL CORES, VENTED END TO END



STANDARD STOCK CORE MACHINE

Suit decided in our favor by the United States Circuit Court, October 13, 1903

Hundreds of Machines in daily use
Cores from 3-8″ to 6″

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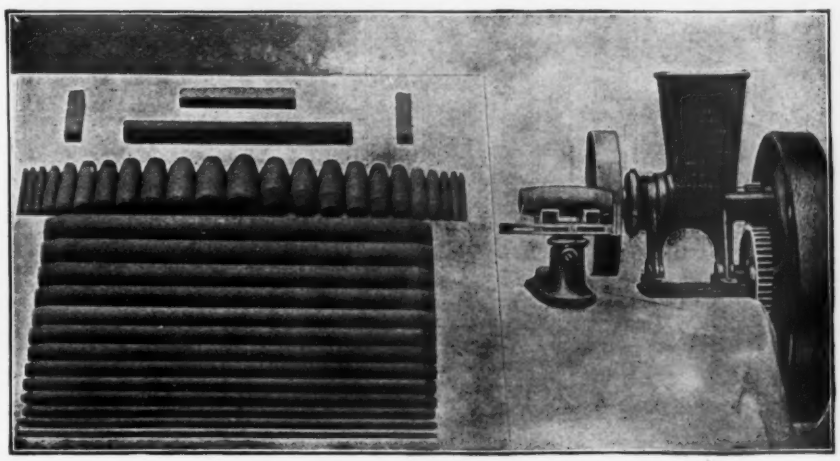
The KENT MANUFACTURING COMPANY

— FORMERLY —

THE RAILWAY SPEED RECORDER CO.

Kent, Ohio, U. S. A.



CUTTING OFF ATTACHMENT

Speakin' of Cranes

Wonder if you know the Ridgway Balanced Steam Hydraulic Crane now in use in hundreds of plants all over the land.

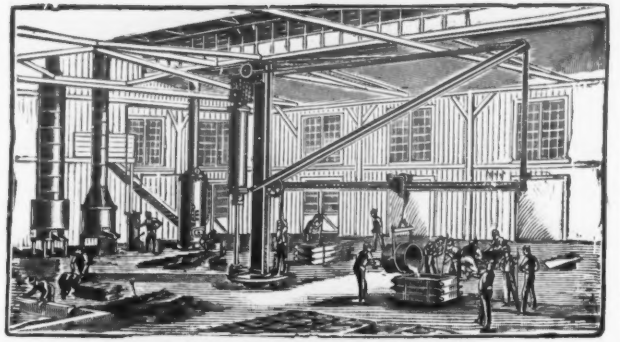
Greatest thing in swing cranes ever produced. Of course, it is much different from all other swing cranes, big, clumsy, slow, hard moving old things that they are.

The Ridgway crane handles stuff as an angel would handle things—quickly, gently, noiselessly. Just a pipe to the boiler does the business and the steam used is too trifling to talk about.

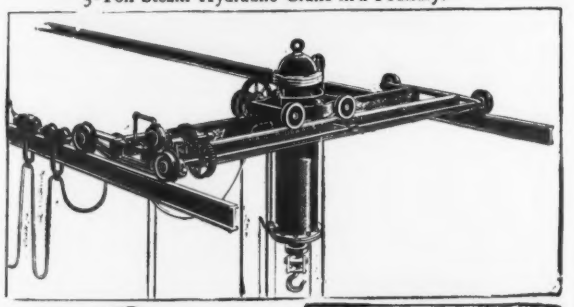
You ought to know the Ridgway Crane.

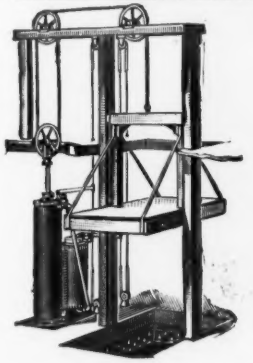
We are making them at this very moment for the newest and best and most up-to-date establishments all over the land where they have engineers who look into things and know what is the best.

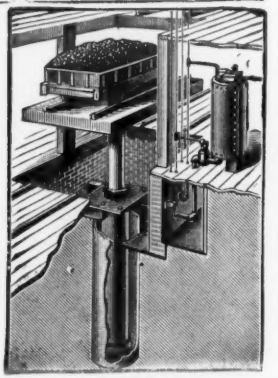
Do you know what it means to have a swing crane that is balanced? Did you ever see a balanced crane? Well!—



5-Ton Steam Hydraulic Crane in a Foundry.







OIL GOVERNED AIR HOISTS

Only intended for those who buy the best machinery.
A little oil in the piston rod makes them perfect.
Cost more to make than other sorts, but not so very much more to buy.

PLEASE TAKE THE ELEVATOR

"Hook'er to the Biler."

CRAIG RIDGWAY & SON CO., Coatesville, Pa.

European Agent, CHAS. G. ECKSTEIN, 49 Kaiser Wilhelmstr., BERLIN, GERMANY.

IRON AND STEEL CASTINGS MADE PERFECT

CAN WE BACK IT UP? TRY US

CAST STEEL CEMENT

WILL QUICKLY PROVE OUR CLAIM

FREE SAMPLES
UPON REQUEST

It is a Permanent Cement—No mere filler-up or smoother-over—it becomes part of the casting itself. It is the pioneer—It is peerless—It is imitated, but never equalled.

ELEVEN YEARS CONSTANT USE

BY IRON AND STEEL WORKERS IN ALL LINES

The best foundry practice does not entirely avoid castings imperfect in appearance only, the strength and efficiency not affected, and they are made perfect by CAST STEEL CEMENT for iron and steel castings.

THE CLARK

Write for free sample

TRADE

CAST STEEL

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Write for free sample

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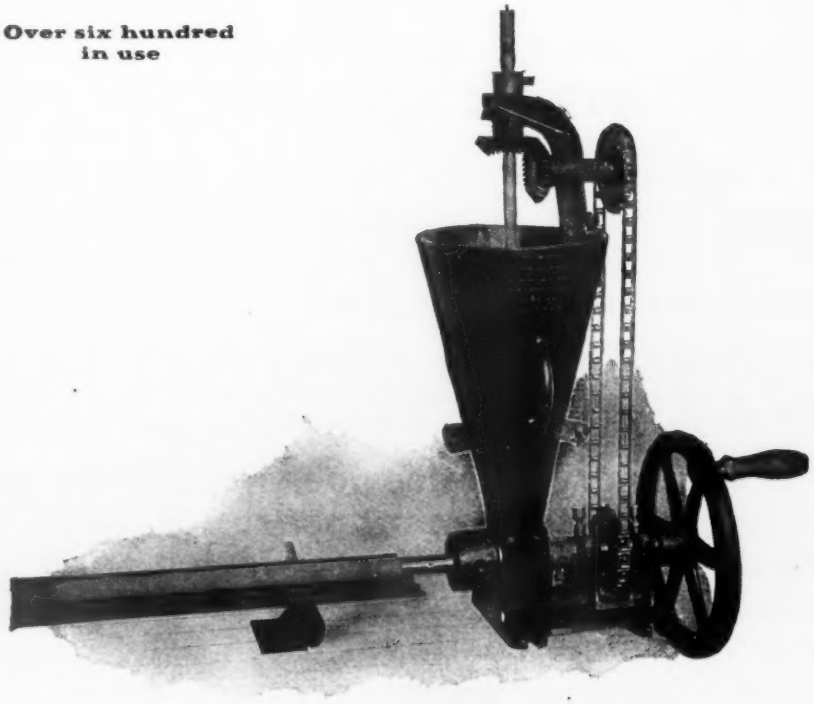
Makes perfectly round cores from

$\frac{3}{8}$" to 2-$\frac{1}{4}$" in diameter

Over six hundred in use



ADVANTAGES

No core boxes required	Less oven space needed
No ramming of sand by hand	Less fuel required
No uneven vent holes	Less breakage
No trimming or filing of cores	Less complaint from your customer

Send for catalogue and sample of core

BROWN SPECIALTY MACHINERY CO.

N. W. Cor. Jackson and Clinton Sts.

CHICAGO, ILL.

FIGURE THE LOSS

every year on the imperfect castings you make.

You'll find it runs up pretty high.

You may not think much of discarding a casting because it contains blow-holes, cracks, etc., but what reason is there for doing so when

Clark's Metallic Filler

will make EVERY casting perfect.

There's no reason.

The cost is a mere bagatelle when the results are considered.

This Cement fixes all blow-holes, cracks, uneven spots, etc., so faultlessly that you cannot detect their presence. It never turns white or works loose and it rusts the same as the casting.

Stop your profit leakage by ordering a sample can TODAY.

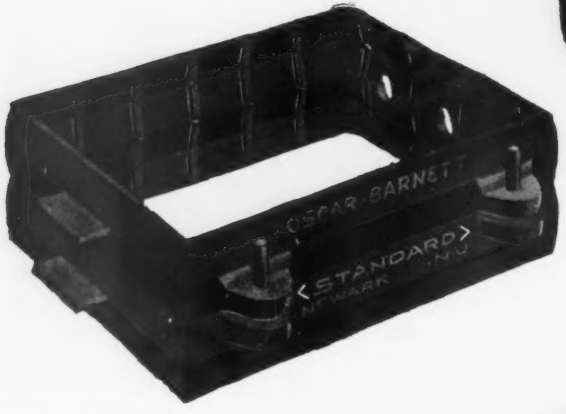
D. N. CLARK

Drawer 11 **SHELTON, CONN.**

BRASS MOLDERS' FLASKS

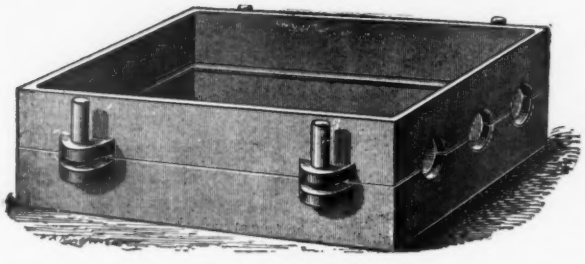
OF EVERY STYLE AND SIZE

Furnaces, Drying Stoves, Spill Troughs, Clamps, Boards, Tongs, Crucibles, etc., etc.



All our flasks interchange with any of same size made by us.

Our own foundries ensure prompt shipments

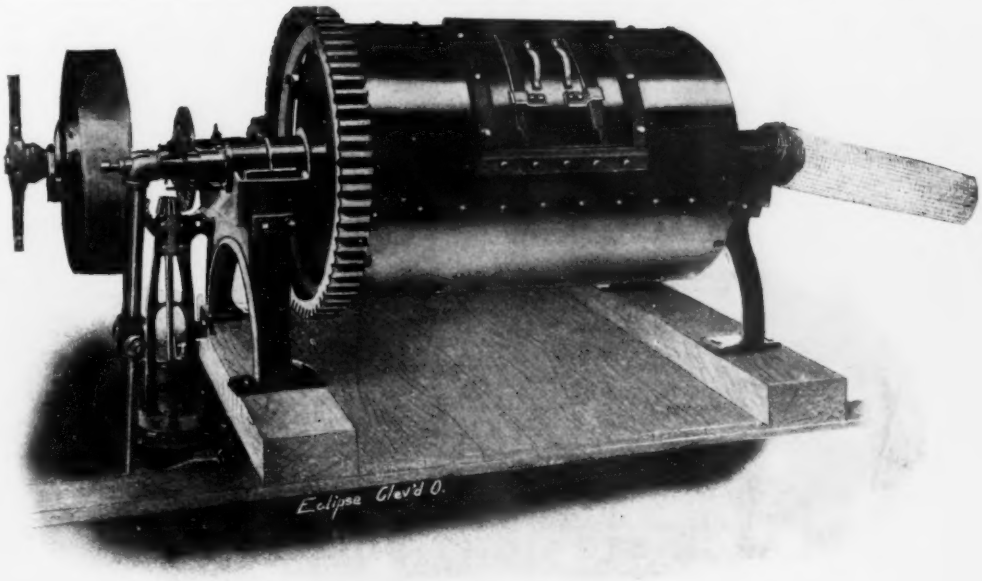


THE OSCAR BARNETT <STANDARD> FLASK

IS MADE ONLY BY

Oscar Barnett Foundry Co.

Founded 1845 **NEWARK, N. J., U.S.A.**



Iron is Money

these days, and every hundred pounds you can pick out from your cupola dump and screenings means that much more profit.

The SLY CINDER MILL will recover 95 per cent of the iron and 75 per cent of the coke, separating each material at one operation. No matter how careful you sift and pick over your refuse, this will still carry from 20 to 35 per cent of iron. Is this not worth saving?

Send for our latest catalog which shows records of the great work being done by the SLY CINDER MILL. Other modern foundry equipment is also illustrated, comprising resin mills, dust arresters, steel exhaust tumbling mills, etc., etc.

THE W. W. SLY MFG. CO.

110 Elm Street ═══ CLEVELAND, OHIO

MODERN FLASKS

"Made a little better than seems necessary." It is a pleasure to work them.

IMPROVED RIB

FOR

BRASS FOUNDRIES.

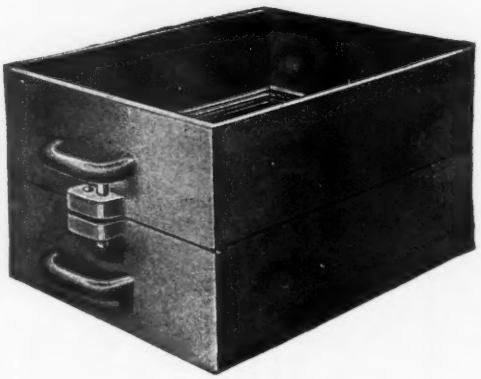
LARGE STRAIGHT SIDE FLASKS

For Floor Work.

MOULDING MACHINE FLASKS

FOR

IRON, BRASS AND STEEL FOUNDRIES.



New issue—Complete Equipment for Brass Foundries—Cat. No. 12.

Brass Founders' Supply Co.

Newark, N. J.

CUPOLA SPARKS

Letters from Josiah Short, practical foundryman, to Jim, foundry superintendent, who has left the former's employ in the capacity of a molder to operate a new foundry.

Dear Jim:

No you don't have to look for trouble in the operation of any foundry, it just naturally comes to you. In fact it is one of the only things you don't have to go after with a searchlight. You can't expect to operate a new plant without trouble, and never expect to continue operations without more trouble. The percentage of bad castings you speak of in your last is certainly very high and not being on the ground am unable to account for the same. Just forget your apprenticeship with me when telling of your losses, as they certainly leave a dark brown taste in the mouth and might put me in bad odor with the trade. One thing's certain, you will have to locate the difficulty, or you'll have a lot of hungry stockholders buzzing around your ears, and I might have to make room for you on the floor again.

Nine times out of ten your trouble can be traced to your mix, but you will also have to keep a weather eye on your coke and use a microscope on your molders. After you are satisfied that the fumes from your coke will not result in a hurry ambulance call, and that your molders are not only half baked and have served their apprenticeship in a specialty shop, dig up your mix, and it is dollars to doughnuts that you are trying to make a silk purse out of a sow's ear.

You can well remember the experiments we made with all grades of iron, and that we paid no dividends during those periods. You also can recall our selection of REBECCA grades from a score of brands with high sounding names that commanded correspondingly high prices. Since using REBECCA we have had no trouble with our iron as you well know, although now and then we get a car of coke that is only fit for a lucifer works. Tell me something about the iron you're using and I will try to help you out.

Respectfully,

JOSIAH SHORT

No. 1 REBECCA FOUNDRY IRON No. 2
Always Uniform

Kittanning Iron & Steel Manufacturing Co.

FOUNDRY AND FORGE IRON
AND MUCK BAR

Offices:
Farmers Bank Bldg.
Pittsburg

Furnace and Mills
Kittanning, Pa.

N. S. Bartlett & Co., 126 State Street, Boston, Mass., Eastern representatives.

NONE SO GOOD.

Cherry Valley Iron

has a proven place as the best soft strong foundry iron.

Most foundrymen who make good castings know—

and many have used it right along for 28 years because it is the same—always.

The Cherry Valley Iron Co.

PITTSBURG, PA.

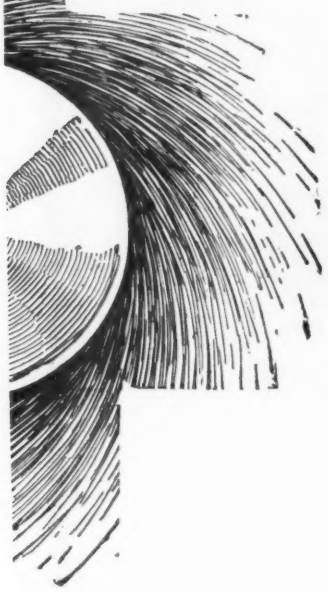
"Pioneer"
Foundry
Pig Iron

William Sellers & Co., Incorp.

PHILADELPHIA, PA.

MODERN FOUNDRY MACHINERY

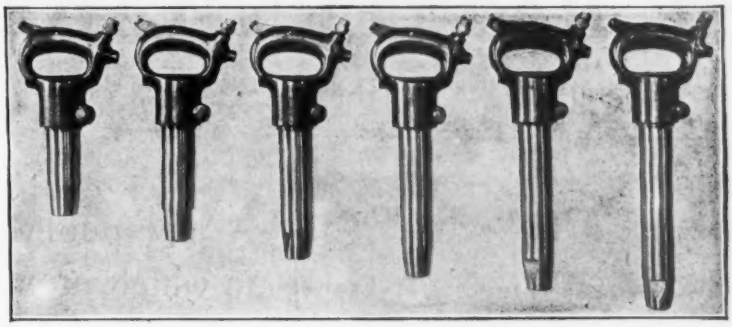
SAND MIXER



Not an Experiment

PRACTICAL
ECONOMICAL
EXPEDITIOUS

NOTE. — In order to clearly explain the **Modus Operandi** of this scientific and practical method of **mixing Molding Sand, Facing Sand and Core Sand**, we have issued a small pamphlet which will be sent on application.



Slow Men

are often simply men who have to work with slow tools. Give one of your slow workmen

Keller Pneumatic Tools

and in many cases they will make him an uncommonly fast workman. The tremendous speed of KELLER TOOLS is a pleasure to the men who handle them. It is almost impossible to work slowly with them. Then they are always ready for work, and don't break down.

Write for our new catalogue and booklet on the "Care and Use of Pneumatic Tools."

PHILADELPHIA PNEUMATIC TOOL CO.,
21ST ST. & ALLEGHENY AVE.,
PHILADELPHIA.
NEW YORK CHICAGO PITTSBURGH
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[FF]

THE PATTERNMAKER

ONLY MAGAZINE OF ITS KIND IN THE WORLD

A new publication in which, month by month, will appear the newest and best ideas in every line of the patternmaking business.

Every up-to-date man in any way interested in the making of patterns will want this magazine.

It will be worth many times its cost, which is $1.00 a year

(To foreign countries, $2.00.)

A sample copy for the asking

THE IRON AND STEEL PRESS CO.
CLEVELAND, OHIO

PUBLISHERS OF

THE FOUNDRY **THE IRON TRADE REVIEW** **THE PATTERNMAKER**

THE BEST WAY

AND

ALWAYS OUT OF THE WAY

THE MONEY SAVING WAY

When a big flask is wanted, instead of getting a small army of men to carry it in by main strength and awkwardness just hook it on a

COBURN TROLLEY TRACK

and one man pushes it right where it's wanted. Same thing when melter wants iron or helpers want sand. Out of everybody's way, too. No fussing about alleyways. It's a money maker in hundreds of foundries. Yours ain't so different. Let us tell you about it. Your address please.

Coburn Trolley Track Mfg. Co.

HOLYOKE, MASS.

FOUNDRY COKE

Connellsville 72-Hour Selected

NOT A CENT

is saved by the purchase of cheap coke. Poor coke makes poor castings, and the slight saving of a few cents on a ton of poor coke costs dearly in the loss of castings.

YOU WANT COKE

that is p u r e, b r i g h t, silver gray and clean, burnt hard for 72 hours. Our coke answer all these requirements.

For **Hardness of Body, Fully Developed Cell Structure, Purity** and uniform **Quality, specify our Coke.**

We own **1,100 OVENS** and can always insure an ample supply. Owning our own cars always insures prompt shipment.

OLIVER & SNYDER STEEL CO.

OFFICES:
10th and Muriel Sts.
PITTSBURG, PA.

OVENS:
In the heart of the
Connellsville Region

QUICK BAKING, NO BREAKING.

The Millett Way

places cores on hinged shelves that swing in and out without a jar and keep the oven closed whether shelf is in or out. No wasted heat. No broken cores.

Compare this with the old time pushing in and hauling out of core plates, the burned arms, the half baked and burned cores, the wasted heat, the time lost in waiting for cores—then order a

MILLETT CORE OVEN

THE MILLETT CORE OVEN CO.

Brightwood, Mass., U. S. A.

SALES AGENTS: S Obermayer Co., Cincinnati and Chicago J. W. Paxson Co., Philadelphia
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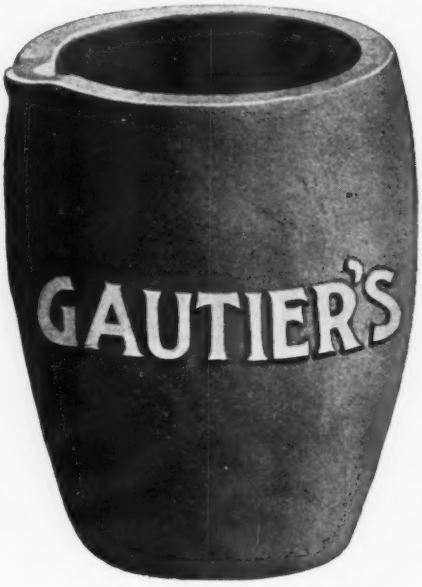
The standard
of Crucible Excellence
for nearly fifty
years



J. H. GAUTIER & CO.

JERSEY CITY, N. J.

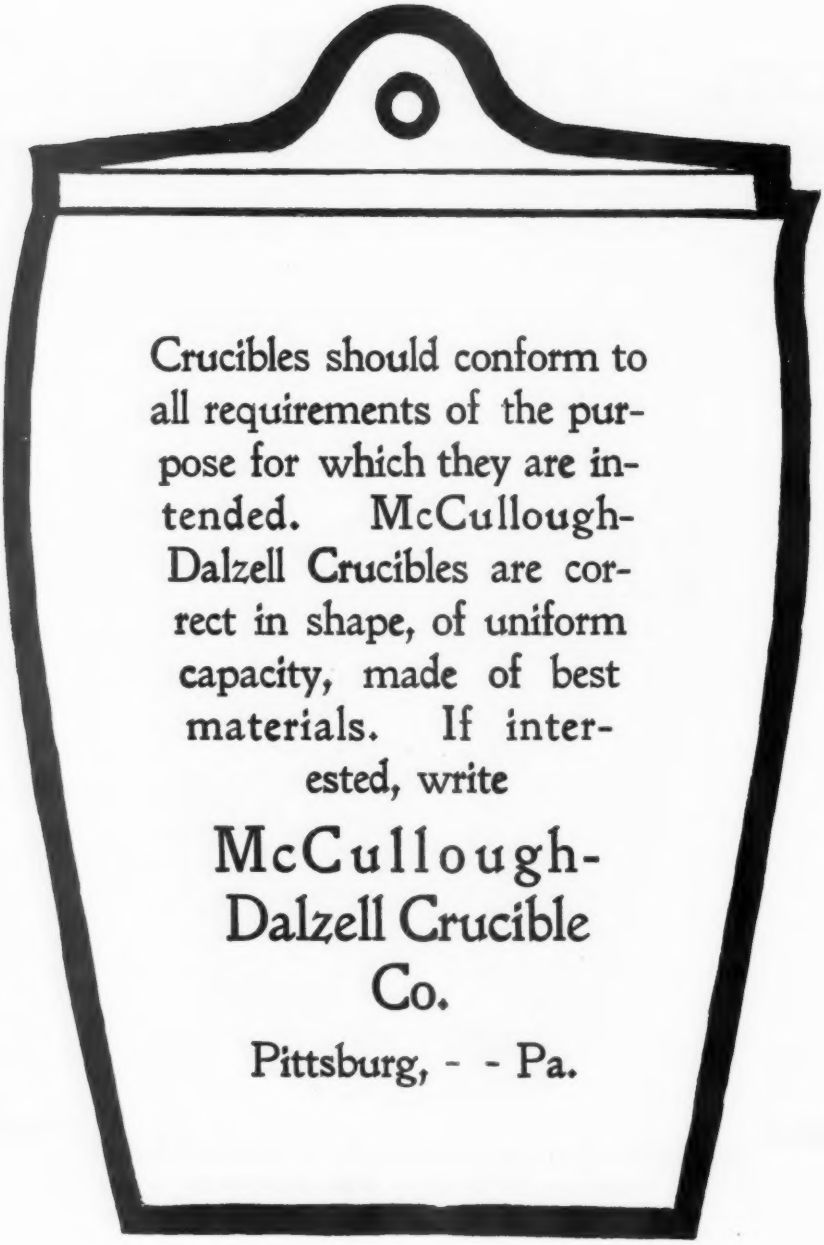
42 Heats on "High Brass"

This is regularly required by several users of DIXON'S PLUMBAGO CRUCIBLES and DIXON'S CRUCIBLES never fail.

DIXON'S PLUMBAGO CRUCIBLES wear evenly, as shown in this photograph

Joseph Dixon Crucible Co.

Jersey City, N. J.


Crucibles should conform to all requirements of the purpose for which they are intended. McCullough-Dalzell Crucibles are correct in shape, of uniform capacity, made of best materials. If interested, write
McCullough-Dalzell Crucible Co.
Pittsburg, - - Pa.

This trade mark stands for the acme of crucible uniformity.

There's no guess work in the manufacture of a Taylor Crucible. Only the highest grades of material are used, and working strictly by our chemical analysis, we give a uniformity in the quality the year round, that is not approached.

A trial will convince you.

Robert J. Taylor, Incorporated

1900 to 1916 Callowhill Street

PHILADELPHIA, PA.

Two Five-Motor Electric Travelers. Capacity 35 tons each. Span 75 feet. Furnished Commonwealth Steel Co., St. Louis, Mo. Five Electric Cranes furnished above company.

ELECTRIC TRAVELERS

CRANES OF ALL KINDS

ALL TYPES

ENGINEERS, DESIGNERS AND MANUFACTURERS

COMPLETE EQUIPMENT FOR GRAY IRON, CAR WHEEL AND PIPE FOUNDRIES

MALLEABLE AND STEEL CASTING PLANTS

1200 IN USE

Catalog "F" on request

WHITING FOUNDRY EQUIPMENT CO.

GENERAL OFFICE AND WORKS: HARVEY, ILL., U.S.A. (CHICAGO SUBURB)

THE FOUNDRY

Vol. 24, No. 3. *CLEVELAND, OHIO, MAY, 1904.* *Whole No. 141*

Foundry of the American Locomotive Works, Schenectady, N. Y.

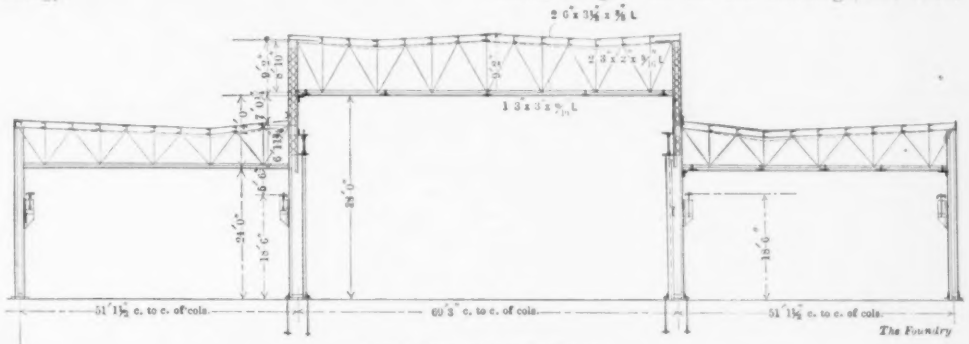
After the American Locomotive Works had been formed and the various plants had been taken over, a large amount of work was done in the reconstruction of different plants so as to reduce the expenses of making locomotives and at the same time, if possible, to improve the quality of the work. In this connection several of the plants were partially rebuilt and much new equipment added. At the Schenectady plant a new group of buildings, including a foundry, were constructed on a plot of ground across the Erie Canal from the old works. This foundry of course was built for a special line of work, and hence laid out to produce that with the least expenditure of energy.

The plant presents many interesting features which will be found of use to all foundrymen. It is probable that the foundry trade in general owes more in the way of advancement to engineers who have solved these special problems than to any one else, on account of the fact that in such a case more time is generally given to studying the actual molding problems and the arrangement of plant and equipment than in cases where a general line is to be manufactured.

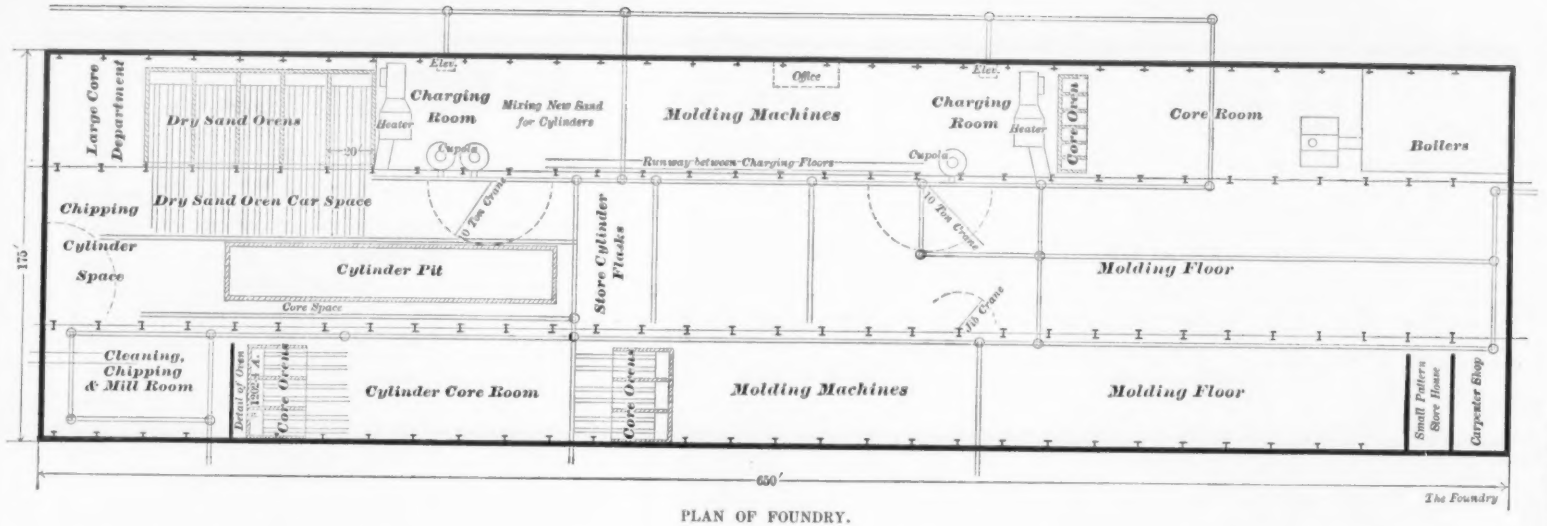
EXTERIOR OF FOUNDRY BUILDING.

Foundry Building.

All of the new buildings of the Schenectady plant are of a new, and so far as we know, novel design. In the old buildings, the roofs



CROSS SECTION OF FOUNDRY.



PLAN OF FOUNDRY.

were so constructed that the rain water passed off over the eaves. In the winter this gave a great deal of trouble, on account of the accumulation of great masses of ice and the stopping up of the gutters and conductors. Then, too, any roof pitching from the center toward the edges gives a large amount of dead air space which must be heated, and also reduces the amount of wall area available for windows. Recognizing these facts, the engineers in charge of the work reversed the usual procedure and gave the roof a slight pitch from the walls inward, as shown in the cross section of the building. The advantages of this construction are that the water flows from the walls to the lowest depression of the roof, from which it is conducted by inside conductors which pass down the columns to rain water sewers. Also, this arrangement allows the use of much higher windows, especially in the Monitor roof, thus providing ample light. Sky-lights always give more or less trouble and hence these large vertical windows are a decided advantage in a foundry, especially when they can be obtained without increasing the number of cubic feet of building to be heated.

Melting Equipment.

The melting equipment consists of three cupolas 66 inches inside the lining. There are two charging platforms so located as to divide the length of the building into two equal divisions. Two of the cupolas are located at one platform and one at the other. The charging platforms are connected by a runway. The pig iron and coke are stored in the foundry yard, where they are loaded onto large trucks, taken to elevators, raised to the charging floor, and wheeled to the desired location. The charging floors are covered with rough surfaced iron plates. The blast for the cupolas is furnished by Root blowers located in small rooms back of the cupolas and under the charging platforms.

Heating and Ventilating Equipment.

The Sturtevant system is used for heating and ventilating the building. Two units are installed, one under each charging platform.

SMALL MACHINE FLOOR AND OFFICE.

The steam for the heating system is furnished by a battery of boilers in one end of the foundry. This battery also furnishes steam for two adjoining buildings.

Molding Machine Equipment.

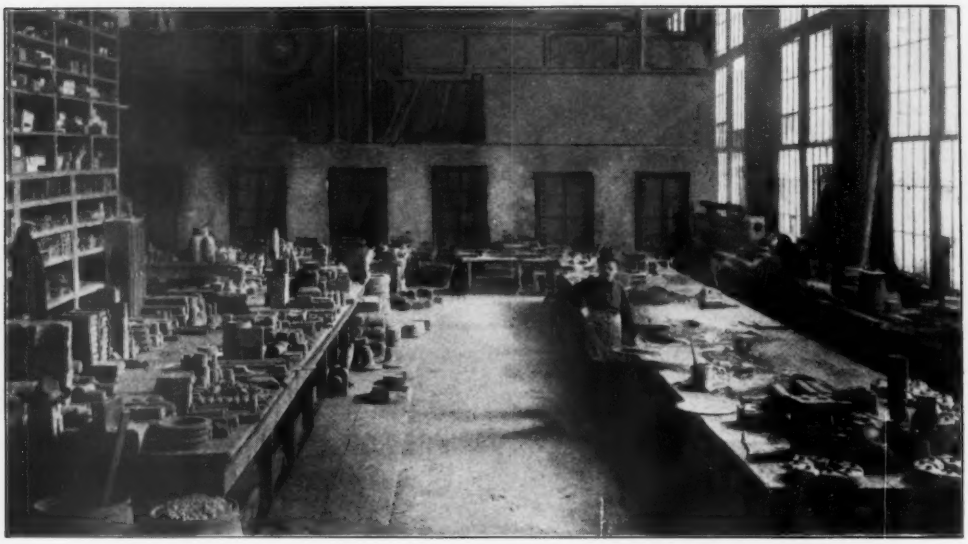
As they have a large number of standard parts to make, the foundry has been equipped with a number of molding machines. These are located in the side bays in three groups. They have at present installed the following molding machine equipment: One, 18 by 28 inches; one, 18 by 26 inches; one, 20 by 30 inches; five, 16 by 26 inches; three, 12 by 18 inches; two, 12 by 42 inches; four, 30 by 30 inches; seventeen in all.

All of the machines were made by the Tabor Mfg. Co. The equipment of these molding machines is very interesting indeed, as many of them are provided with wooden match and stripping plates made by the process described by Paul Ramp in the January number of *The Foundry*. It would, however, be impossible to go into the details of this equipment in a general article of this character.

Sand Mixing and Core Equipment.

The work of this foundry divides itself naturally into two parts, that is, the green sand and dry sand departments. The cylinders are cast in dry sand molds, while practically all the rest of the work is cast in green sand. The green sand molding floor for work not put up on the machines is located

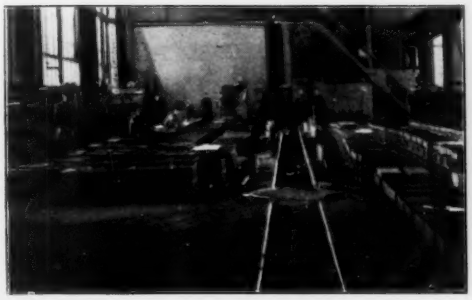
LARGE MACHINE FLOOR.



SMALL CORE DEPARTMENT.

in the central bay at one end of the building and in a portion of one of the side bays. Opposite the portion of the central bay given up to this class of work is located the small core department in which all of the small cores for green sand molds are made. These cores are dried in core ovens of the reel or turnstile pattern. The cores for the cylinder work are all made in a separate department in one of the side bays opposite the cylinder floor. A series of core ovens provided with trucks are arranged at each end of this department, so that any core will have to be carried the minimum distance to deposit it in the core oven. Most of the cores are taken from the ovens and placed along the edge of the cylinder mold pit at once, so that they require a minimum amount of handling. The loam cores for the barrels of the cylinders are swept up either in a rig upon the trucks upon which they are to be dried, or on stands immediately in front of the core ovens, so that they will have to be handled as little as possible. On account of the fact that a number of large ovens were required for drying the cylinder cores, arrangements were made to

LARGE CORE DEPARTMENT.

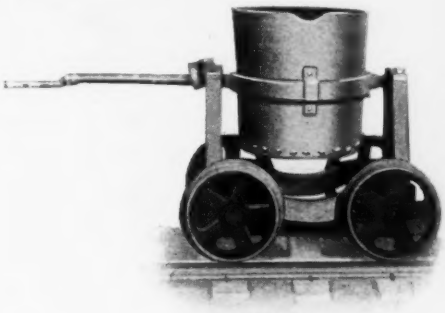


SMALL MACHINE FLOOR.

SAND MIXING.

make the large cores for green sand molds in a department adjoining these ovens.

All of the sand for the core departments and the facing sand for the green sand and dry sand molds is mixed and prepared in separate departments, there being several of



TRUCK LADLE.

these departments located at various points in the foundry, so that the sand will be mixed near the place where it is to be used.

Cylinder Mold Equipment.

It would probably be difficult to find a more complicated casting of large dimensions than a locomotive cylinder, especially such as are used in the large compound engines. In order to produce these molds as accurately and at the same time as cheaply as possible they have gone to a large expense in the shape of rig-

CYLINDER MOLDS ON OVEN TRUCKS.

ging. In the first place, special iron flasks having curved parting lines corresponding to the port lines of the cylinders are provided. These molds are rammed up on the floor, taken by the crane to the trucks of the drying ovens, dried, and then taken to the cylinder casting

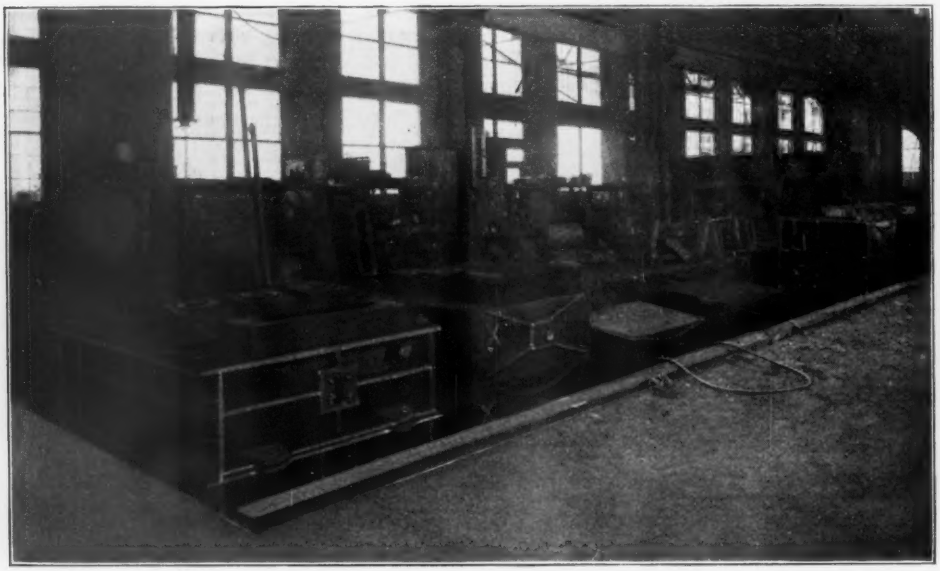
CYLINDER FLOOR.

CYLINDER MOLDS IN PIT.

pit where the molds are assembled. This pit has a capacity of 10 cylinder molds and is deep enough so that the molds can be poured without the man having to use any kind of a platform for controlling the pouring ladle. In the accompanying illustrations the pit is plainly shown in one case with a number of partly finished molds in position, and in another case with a portion of the molds completed and ready for pouring.

Cleaning Equipment.

As the cylinders are the largest castings which have to be handled the cleaning department is placed next to the cylinder molding floor, thus reducing the handling of these heavy castings. The cylinder molds are cleaned in the central bay of the foundry, while the smaller castings are cleaned in the end of one of the side bays. This department is equipped with tumbling barrels, pneumatic



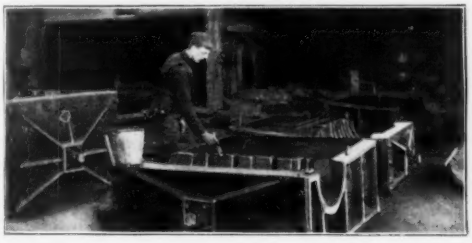
CYLINDER MOLDS READY FOR POURING.

CYLINDER CORE DEPARTMENT.

chippers, and the necessary handling equipment.

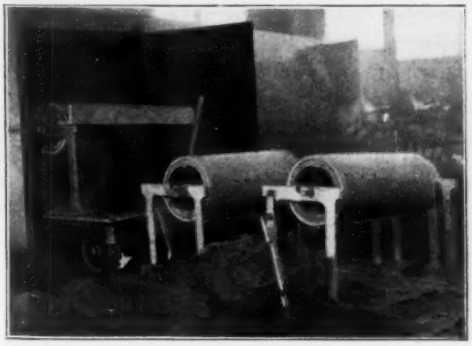
Handling and Transportation Equipment.

The foundry is equipped with a double system for handling castings and supplies. A series of narrow gauge tracks extends through



FINISHING CYLINDER MOLDS.

each bay and into the yard for the handling of flasks, cores, castings, sand, and other supplies. The central bay and the one devoted to heavy work are also provided with traveling cranes. In the central bay there are two 35-ton and two 10-ton cranes, while in one of the bays are located one 10-ton and two 3-ton travelers. The cranes in the bay travel over the core ovens and cylinder core department. They also serve the larger molding machines. In addition to this there are two 10-ton, two 5-ton, and eight 2-ton jib cranes, located in such a position that they can serve different portions of the floor and the cleaning department.



MAKING LOAM CORES FOR CYLINDERS.

Control of the Foundry Mixtures.

For the control of the iron mixtures they have a chemical analysis made of all the iron and supplies received and of the castings made. They also make physical tests from each heat and from each cylinder casting. They use the ordinary transverse test with the one-inch square test bar supported at points 12 inches apart, the tension test, and the drop test. The drop test is made with a one inch square bar on supports 12 inches apart and a 10-pound weight is dropped so as to strike the bar in the center. The first blow is struck with the drop falling 15 inches, and is raised one inch for each succeeding blow until the bar breaks. The test bars are cast with chilled ends and this chill is also observed.

Mr. R. McFarlane is foreman of the foundry and Mr. F. R. Sibel assistant foreman. The testing of all materials for the entire plant is carried on under the supervision of Mr. J. A. Kinkead, engineer of tests. They also have a very extensive photograph department under the charge of Mr. H. Wedlake and we are indebted to them for a number of the photographs used in this article.

GREEN SAND BOTTOMS AND SOUND CASTINGS.

BY H. L.

These two subjects may not seem to be very closely connected, except as far as scabs, etc., are a cause of unsoundness, but it will be my endeavor to show a close relationship between them in other respects. The particular unsoundness I have in mind is shrink holes, which have generally been considered a matter for feeding, or the regulation of the metal, or both. Writing some years ago in *The Foundry*, Mr. Moore contended for a side feed, arguing that the use of a feeder on top of a casting brought the shrink hole into view, while with a side feeder it remained some distance within the skin, thereby admitting that this method did not eliminate the shrink holes, but simply kept them out of sight. This is all right when no severe tests are applied and the job is satisfactory if it has a sound skin; but where considerable machining is done, and the casting afterwards

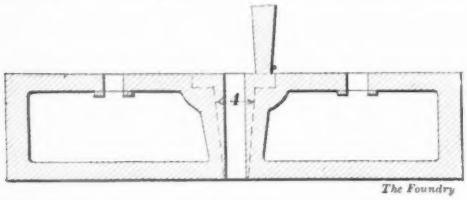


FIG. 1.

submitted to steam or hydraulic pressure, the top feed is only one, and this often fails to give satisfaction.

The piston shown in section in Fig. 1 will serve to illustrate the point; dimensions 2 feet 8 inches by 6 inches deep, cast with 2¼-inch straight round core; it is afterwards bored out taper and deeply countersunk, as indicated by dotted lines. After being turned up and bored, all but one of the core holes are plugged and hydraulic pressure applied through the remaining one, when they often show a leakage in the center hole or countersinking. This might be held to be a trifling defect, but the foundry supplying the castings being a jobbing shop, the customer rejects any not perfect. I have known four made to get one good one. Other castings of a similar style, that is, with a number of dry sand cores in a green sand mold, are often a source of trouble and, by the way, it is always this kind of job which gives trouble from shrink holes, the reason being, in my opinion, that while the outside is chilled by contact with the green sand, the metal in contact with the cores is kept warm (as dry sand is not as good a conductor of heat as iron) and all shrinkage has to be made good from the neighborhood of the cores, thereby locating the shrink holes near the core.

Castings which have been made in green sand several times without getting a good one, have occasionally been transferred to the dry sand department and a good one made the first time. Nothing is more vexing to a molder, or a source of greater loss to a master, than to have a nice looking casting go out of the shop and shortly afterward come back rejected on this account. The molder takes refuge in blaming the metal; the master blames the feeding. There may be some truth on both sides, but there is still another side to be looked at. I was of opinion that if the feeder was kept open and hot metal supplied until the rod was forced out by the setting of the metal underneath, a sound casting was bound to result, no matter what sort of metal was used. I have scores of times tried to put this theory into practice, but, I am bound to confess, with little, if any, more success than my fellow molders.

It seems to me that the proper way to discover the remedy for the trouble, is first to find the cause. If we take the metal in the ladle as a starting point, it is generally allowed to be (if I may so express it) in a state of concentration, and it slightly expands in cooling till it sets. I have seen it stated that it suddenly expands at the moment of setting, but I believe the expansion is gradual and that the hotter the metal the greater the state of concentration and subsequent expansion. The proof of this seems to lie in the common experience that the hotter the metal the sounder the casting as regards solidity. It is also undisputed that the cores in a mold swell for some little time after being surrounded by metal. Every man who has handled a rod has seen the metal forced out by the swelling of the cores in spite of all effort to feed it in. These facts seem to knock on the head the universally accepted notion that cast iron sinks or draws upon itself in cooling; for how can it sink and expand at the same time?

It would appear that if we could make our molds rigid and unyielding against this expansion and prevent the metal oozing out at the runners and risers there would be no need of feeding, and this would seem to be borne

out by the greater soundness of castings made in loam and dry sand, which will not yield to pressure to anything like the extent that green sand will, though they all give some. It is well known that a heavy casting made in the latter will not show anything like the contraction allowed for by the patternmakers' rule of ⅛ to the foot, on account of the mold having given and expanded under the weight, pressure, and, it may be, the heat of the metal.

The exact behavior of the metal in an expanding mold I cannot explain. It is possible that the skin setting and forcing out the walls and bottom is followed by the next layer and so on till a hole is left in the middle. I offer this merely as a suggestion. Mr. West, in the "Molder's Textbook," page 5, gives an interesting record of experiments in casting governor balls, fed and unfed. It would be most useful if Mr. West or someone else in a position to try experiments (which a journeyman is not) would repeat the same with the addition of one ball rammed in fairly open sand as hard as possible and test them for comparative weight and have them split to note the solidity. I would suggest that they be molded with a stripping plate to obviate rapping and that the one be rammed in a very strong box and set on an iron plate and top covered with a plate for casting, in fact, as near non-expansive as it could be made. This, I think, would go far to settle the question of whether iron sinks or draws in setting, or whether it is merely following up the expanssion of the mold.

Some time ago I had a job to make which seemed a good specimen for trying the theory of the unyielding mold. A forming block, 14 inches by 14 inches by 16 inches long with a three inch round core going through it to bore out 3½ inches. It was bedded in the floor on a bed which, except for an inch next the casting, had been rammed as hard as a stone. The sides and top received the same treatment. It was fed for a while, but not an ounce of metal could be fed in, and when bored out it was perfectly sound. I have several times tried this method since, viz., ramming as hard as possible, much harder than necessary, to prevent a visible swell, and invariably with success, and I offer it as a solution of feeding troubles.

One can often get a sounder casting by freezing up the outlets as soon as cast, and thereby preventing the oozing out of metal and consequent reduction of pressure, which the rod permits, but for very heavy jobs I do not care to risk the job without feeding, though, if only the mold can be made firm enough, I believe it to be unnecessary.

EDUCATION IN THE FOUNDRY.*

BY JAS. A. MURPHY.

Education in the foundry, education among foundrymen when of the right sort is as much of a necessity today as it has been in the past, or as it is likely to be in the future.

To keep up with the rapid progress that our Americanized energies have made possible, no foundryman worthy of the name should allow himself to be isolated in such a way as not to be in constant communication with those of his kind interchanging ideas with them and consulting with them on the many problems that are daily arising.

To be abreast of the times and to always be prepared to use the best means and methods of accomplishing results one must be a student of the affairs of his calling, a broad reader and an observer of other people's methods and opinions.

To foster these principles and to promote fraternity among foundrymen in general is the excuse for the existence of the Associated Foundry Foremen. To the end that we may be a credit to ourselves and the great foundry industry of America, in matters of education and fraternity the Foundry Foremen must be given credit for always taking the lead, even though others have left them behind in matters of organization. The foundation stone of all foundrymen's associations in America was laid in Massachusetts by a few progressive foundry foremen and the great educational association, "The American Foundrymen's Association," was the outcome. I may add that the best works on founding were written by foundry foremen.

Although we are a part of the great American Association, forming its first section, we believe we can do an immeasurable amount of good by maintaining our own organization and preserving distinct our own identity.

We can take advantage of many things in our own association that would not be feasible through any other medium. We can do several favors toward each other that do not always come within the pale of the constitution and we can preserve and foster a spirit of charity and fraternity heretofore unknown in the

*Paper read before the Erie Foundry Foremen, March 19, 1904.

foundry world. The time is not so far past when green-eyed jealousy was the feeling one foundry foreman had for another. One was glad of the other's failures and misfortunes. We are gradually changing that so that all are glad of each other's successes. It is within our province to always materially help each other.

We often have difficulties in getting good castings without doing some experimenting that in all probability has been done before by someone else. We may have some inexplicable trouble with some particular brand of pig iron, or we may have one or several of the troubles from which the foundry seems inseparable. This is principally where the value of our Association comes in. Our constitution provides "Section 3. Every Member agrees to forward promptly, upon the request of the Secretary, any information that lies within his power to give. Provided that no foundry foreman shall be asked to advance information which would violate his obligations to his employer." The day of many of the so-called trade secrets is gone by and the man who thinks he can bottle up foundry tricks unknown to his neighbor, believing that he is the whole thing is generally the man that is found wanting when brought into contact with the more enlightened part of the world.

We endeavor in all things to keep the importance of the foundry to the front, for strange as it may seem, there are hundreds of foundrymen throughout this broad land of ours that are constantly losing money through eighteenth century facilities and obsolete methods of working.

Onward and upward should be the slogan of every energetic foundry foreman in the country.

This circular, sent out by me last summer, has done a great deal to stir up the foremen to the necessity of organization.

DEAR SIR:

Enclosed find a copy of the constitution of the Associated Foundry Foremen as well as an application which we hope you will fill out and return to the secretary with the necessary initiation fee for one year's dues in advance.

We feel that the objects of this Association ought to be called to your attention, for with the advance of thought, scientific and practical among the engineering professions, we find ourselves the only large body of men having the practical control of shop affairs without a strong and compact organization through which we may assert ourselves.

It is within the power of those having charge of foundries to improve themselves by a liberal interchange of ideas, and by acting as a unit on matters affecting them in any part of the trade. To be mutually remunerative to the fullest extent the Association should have the hearty co-operation of every Foundry Foreman.

However much such things are to be desired, it is a well known fact that many of our Foundry managers are indifferent to the progress which surrounds them on all sides, and to this alone may be attributed the fact that after the two and one-half years that this Association is in existence it has as yet only about 150 active members.

It is true that many Foremen, leaders in thought and generally recognized as among the foremost in the country are members. But that is not enough.

We want every foreman to be a member.

We cordially invite you, and promise you all the support and help that our organization can give in any matter affecting your status as a Foundry Foreman.

Many of the higher ideals of our Association have for the present been abandoned to await such time as we become numerically and financially stronger.

No Foreman should feel that his employer may, perhaps, have a prejudice against our Association, as we point with pride to the fact that we have received the endorsement and support of the American Foundrymen's Association, we forming the Foundry Foremen's section of that powerful and influential organization.

The foremen of large cities would find it of particular advantage to have a strong conservative organization. The many benefits that accrue from such Associations when conservatively managed are too well established to be dwelt upon to any length here. To such local branches of our Association we are ready to at any time grant charters and give all the help in our power to steer them in a methodical course for the mutual advantage of its members.

We trust that this appeal will not be lost upon you, but that as a practical man, believing in the advancement of our profession you will give us your aid in the cause of education, mutual help and the practical advancement of Foundry management.

Hoping to have your application at an early date,

We remain, yours sincerely,

THE ASSOCIATED FOUNDRY FOREMEN.

Unhappily, it is a hard matter to reach many of them, and I am sorry to say that there are several hundreds of employers or their managers in this country that read so little about what pertains to their own business that they do not know of our existence or our principles, and if we address a letter to the foreman in their care it finds a resting place in the most convenient waste basket.

The Association is of the greatest benefit to the employer or foundry operator, for to a great extent the mechanical and operating skill belong to the foreman, and they have been known to either beggar or enrich a concern according to their knowledge and ability.

Anything that in a practical way educates or enlightens the foreman is certainly a great benefit to the man whose money is invested in the foundry and any organizaiton or institution that undertakes to do this in a prac-

tical way is deserving of the support and hearty co-operation of the whole foundry world. Several foundry operators have materially helped us and have referred to us to place them in communication with capable men. This employment feature is about the only pecuniary benefit we can bestow on our members. We always endeavor, when requested, to place employers in communication with men suitable to their requirements. This of course is done in the most confidential manner.

I have discovered during my time of office, after a careful research of natural history that the only real live rival of the Australian kangaroo is the American Foundry Foreman. He can jump farther and sometimes oftener in one year than the kangaroo would in a generation, and some of them if they keep up the pace will find it necessary to carry a Marconi apparatus in their hind pocket if they must keep up communication with their friends.

The Association is fortunate in having amongst its membership the leading foremen in the country, and the influence that they wield for good in the foundry is not to be belittled or slighted.

Great progress has been made during the past year. The first local organization here in Erie has shone out as a beacon light to the rest of the country. Then followed Milwaukee, Chicago, Indianapolis, and New York, and at present there are several in process of organization in large foundry centers, and the next convention will see the foremen organize as a permanent fixture in the American Foundry World.

MILWAUKEE FOUNDRIES.

Mr. Thos. W. Sheriffs, of the Sheriffs Manufacturing Co., gave an outline of the growth of the foundry business in Milwaukee at a recent meeting of the Milwaukee Foundrymen's Association.

According to his statement, the first foundry was built by Downey & Mosely in the early 50's. Its power was furnished by the old canal, which also furnished power for flouring mills in those days. This foundry had passed out of existence before Mr. Sheriffs' time. When he was a small boy he played about the foundry which stood on Cedar street between West Water street and the river. This foundry was owned by Sercomb & Bagnall, who subsequently sold it to Thomas Turton. In the early 60's the foundry again changed hands, being purchased by Edw. P. Allis & Co. In 1868 the main building was moved on river scows to the foot of Clinton street and from there on rollers to Florida and Clinton streets, where it stood until about eight or ten years ago when the Allis company built a larger plant in its place, having in the meanwhile built all around it.

The first locomotive built in Milwaukee was made by the Menomineee Locomotive Works in 1849. It was intended for the Milwaukee & Mississippi railroad, now known as the Chicago, Milwaukee & St. Paul. The locomotive works were owned by Lee & Walton. Many other small foundries existed in the early days and were mostly located in the downtown district, from which most of them have moved, one by one, into the outlying districts.

Mr. Sheriffs mentioned a number of interesting points in the history of these various foundries and ended his address by stating that at present there were 37 foundries now operating in Milwaukee, the names of which he read.

Among the recent achievements of many business concerns of Baltimore in resuming operations after the recent fire, that of the *Manufacturers' Record* is worthy of special mention. The printing house of the *Record* was destroyed together with much matter in type and manuscript for the issue of Feb. 11. It was impossible to publish the *Record* in Baltimore, and arrangements were hurriedly made to have the printing done in Philadelphia. The question how to provide cuts for the advertising pages was met with the assistance of photo engravings which furnished the means for plates for the full advertising pages as they stood before the week of the fire. The *Record* appeared as a 100-page paper without a single department omitted on the regular publication day.

The Bourbon Copper and Brass Works Co., of Cincinnati, O., will manufacture and deal in all kinds of castings. The incorporators are: Thomas Ford, Peter W. Bardo, George Schich, Emory M. Garrison and Albert Bettinger. The capital stock is $50,000.

The Troy Scrap Iron & Metal Co., Troy, N. Y., has been incorporated with a capital of $25,000. The directors are: A. L. Harper, P. A. Gillespie and M. T. Gillespie, Troy.

The Whitlock Coil Pipe Co., of Hartford, Conn., has just started a brass foundry in connection with their works.

THE FOUNDRY.

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Practical articles pertaining to the trade in all its branches are solicited and will be paid for.

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TRADE OUTLOOK.

The situation in the iron and metal-working trades is not so clear as to make comment all one-sided. In some respects there has been improvement in the past month, but the long continuance of winter weather has held back work in many instances, and there is a disposition among both manufacturers and buyers of castings to move conservatively. The impression is general that the permanency of the improvement noted a month ago is not as fully assured as important interests would like to see. Much interest has been taken in the report of pig iron production in March, the blast furnace capacity active on April 1 and the reduction of pig iron stocks last month. The total production of pig iron in March was reported as 1,565,507 tons, or at a yearly rate of 18,000,000 tons, against 921,231 tons in December, which represented a yearly rate of less than 11,000,000 tons. Stocks at merchant furnaces were reduced 74,000 tons in March, which, with an increase of 102,876 tons in the production of merchant furnaces in that month, represents an apparent increase of consumption of merchant iron of about 176,000 tons.

The significance of these figures cannot be correctly gauged without knowing some facts that are not on the surface. It would be interesting to know how much of the reduction of furnace stock is merely the transfer of iron from furnace yards to foundry yards, for in a good many cases furnaces required their customers to take forward all iron bought for March delivery before the end of the month, with the alternative of cancellation. As this iron was bought at less than today's prices there was very little cancellation. The $10 Birmingham basis for Southern No. 2 iron is very generally maintained, with one or two sellers asking $10.25. Northern irons have advanced in the month and $13 to $13.50 at furnace is the common range among Central Western sellers. A meeting of Ohio blast furnace companies was held at Columbus, O., on April 15 and another meeting was appointed for April 22, the effort being to get a better understanding as to prices for foundry iron.

In the foundry trade pipe work promises a heavy tonnage. The plans for St. Louis water works extensions call for 100,000 tons. Cincinnati will extend her water mains to a total of 50,000 tons and New York is adding to her high pressure fire service, the probable requirements being 80,000 tons. This work will extend into next year and possibly the year following but the tonnage for 1904 will be considerable. The Pennsylvania tunnel castings are also a factor in this year's calculations. The three years' deliveries will amount to 240,000 tons. The jobbing foundry trade is generally dull; light gray iron work, while not what it might be, has improved in the month. Agricultural works are quite busy. Steel foundries complain both of prices and volume of work.

The stove founders and the Iron Molders' Union in conference at Chicago over the demand of the manufacturers for a 15 percent reduction in wages decided to make no change. The molders agreed to a proviso by which foundries might have more apprentices where under the present ratio they were not afforded a sufficient number of capable men; they also exempted members of the stove founders' association from discrimination because of failure to use the union label. The national conference of the Iron Molders' Union and the National Founders' Association, after four days of sessions, April 7-10, adjourned without agreement. Wage questions were not considered, but matters of shop practice—apprentices, limitation of output, and the request of the founders for a proviso that would permit the employment of a certain percentage of men at less than the minimum wage. In Indianapolis, Cleveland and Buffalo, wage agreements between the machinery molders and foundrymen have expired, but it has not been possible to secure new agreements. Meantime work continues.

Foundry Exhibit at St. Louis.

The foundrymen in the different centers who have been interested in trying to arrange for a foundry exhibit at St. Louis have done a large amount of work and raised a considerable fund for it, but owing to the fact that the time is so limited, it has finally been decided to abandon the enterprise rather than to be excessively late or to do it in anything but the very best manner possible.

Great credit is due to the various members of the committee for the enthusiastic work which they have done in this connection, and it is to be regretted that the work was not commenced earlier, as in this case undoubtedly a creditable exhibit would have been made.

Foundrymen's Association.

Once more we call the attention of the foundrymen throughout the country to the meeting of the American Foundrymen's Association in Indianapolis, on June 7, 8 and 9, and in St. Louis on June 10. Anything that will tend to improve the quality of the foundry work in the country should be of interest to all, and we feel that not only should all members attend, but that employers should be represented at this meeting by not only their foundry foremen, but if possible, their patternmaker foremen as well.

We also wish to call attention to the fact that the association is especially anxious to have foundry accountants and chemists come. The meeting bids fair to be well attended and to be one of the most interesting held thus far.

Old Crucibles.

Mr. Buchanan's article in this number of *The Foundry* deals with the subject of old crucibles. Until recently these have had no commercial value whatever in this country, but now in some quarters they are quoted as being worth a certain figure, on account of the material which is in them and which can be used in making facings. In this country, few, if any, of the foundries are equipped with their own facing mills, and hence few of them would be in a position to grind their own old crucibles, but it seems as though in these days in which economies are watched so closely that some use should be made of them, especially in the case of companies using large quantities.

Glossary of Foundry Terms.

In another part of the paper we publish a "Glossary of Foundry Terms." None who are connected with the business can fail to see the advantage of having a uniform practice in regard to the names by which we call the various objects associated with the foundry business. The publishing of such a glossary should serve to show what current practice is in so far as the author of the paper has been able to determine it.

In Mr. Buchanan's recent book on foundry work he has published a very interesting glossary of foundry terms. In case any of our readers take exception to any of the definitions given, it would be interesting to have them write in, stating their objections.

FOUNDRY COSTS: THEIR ANALYSIS AND REDUCTION.*

BY HENRY HESS.

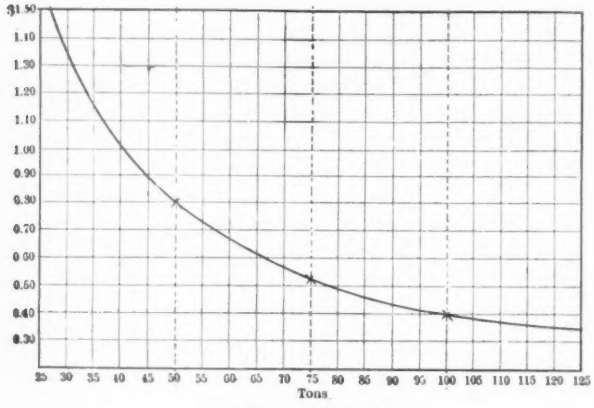
In order to economically manage a foundry it is necessary to know accurately the various elements of expenditure and, having these, to analyze properly their relation to one another and to the product. The manager is then in a position to check at once any rising tendency of the costs or to bring about a reduction, as the analysis points out an opportunity. No doubt, all of this can be, has been, and is being done successfully today by many a foundryman to the entire welfare of the business without any conscious or formal analysis or detail accounting. There are many managers of the old school who, through personal experience, a high order of native talent, and close touch with every detail, get along without other aids. But in these days of large and growing concerns, it is neither advisable nor safe to rely utterly on one man, no matter how capable, nor yet to the best interests of all concerned to burden the higher officials with the infinite detail work needed to get into sufficiently close personal touch with the entire working routine.

It is quite possible so to present the vital elements of cost that the managing head can at once grasp all salient features, see whether cost is stationary or not, and determine where effort must be applied to check a rise or bring about a reduction. The necessary work forming the basis of analysis can be readily per-

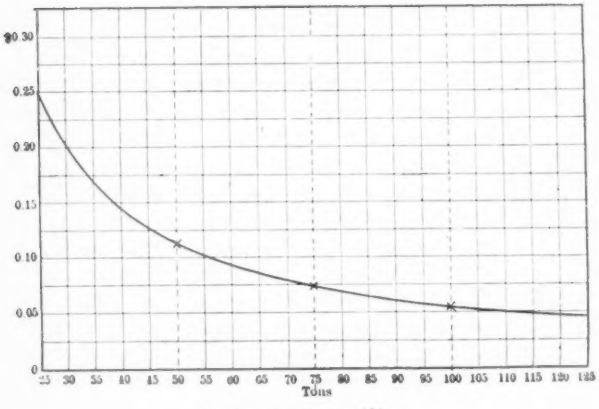
*Paper read before the Engineers' Club of Philadelphia, Pa., October 17, 1903.

formed by a very ordinary grade of shop clerk, once the routine has been fixed.

To start with, all of the elements of cost must be enumerated. It is well also to assign to each element a value, not so much with the idea that this value is absolutely correct, but rather to have some basis of comparison; experience may be relied upon to gradually bring about correct values. The figures given hereafter are to be taken as having merely an illustrative value; no attempt is made to provide a record of actual or proper costs.



GENERAL EXPENSE (*a*).



FIXED SALARIES (*b*).

In illustration, the elements of cost are divided among a few main heads as follows, it being understood that for actual work a subdivision more in detail must be used; to enumerate them fully is outside the province of this paper, in which it is intended merely to present in general outlines a successfully used plan:

(*a*) General expense.
(*b*) Fixed salaries.
(*d*) Power.
(*e*) Miscellaneous materials.
(*f*) Labor.
(*g*) Pig and other charging metal.
(*h*) Smelting material.
(*j*) Light.
(*k*) Recovered material.

The collating of the actual amounts of the various items as incurred is best done weekly rather than monthly or at other long intervals, as that will permit the recognition of a defect in time to trace it correctly to its cause and to apply a remedy. Should a longer interval be determined on, that should be four-weekly rather than monthly, in order to avoid the disturbing effect of the varying number of working days in different months, and also because it fits in better with the weekly pay accounts. Such charges as are based on a monthly rate can very readily be converted into an annual and from that to a weekly rate.

Apportionment of the various elements of cost to main divisions is made in accordance with readily apparent principles:

(*a*) General expense: Depreciation and interest charges.

(*b*) Fixed salaries: All salaries to persons having a fairly certain tenure of office; salaries to minor clerks that are likely to vary in amount should be entered under labor.

(*d*) *Powers* All charges directly connected with the power plant.

(*e*) Miscellaneous materials: Sand, flour, chaplets, wire, molders' implements, etc.; in fact, all materials not accounted for under heads *g* and *h*.

(f) Labor: All payments made to workmen and other persons. Includes all pay not taken care of under head *b*.

(*g*) Charging metal: Everything charged into the cupola, except fuel and flux; also all "medicine," whether added in the cupola or ladle.

Note.—For purposes of comparative analysis thes: materials should be rated at fixed values, although they will be purchased at more or less fluctuating rates. In order to take care of the difference between the assumed fixed and the actual fluctuating cost, the difference

should be determined at suitable periods, and this difference debited or credited, as the case may be, as a "market equalizer" affecting the profit and loss account. Should the fluctuations be large, it will be advisable to make use of a "special charging account" to properly analyze the influence of various brands of iron and scrap on the cost of the charge. Preference is to be given to determinations at short intervals,—say quarterly,—rather than longer ones, as changes can then be ordered made in time to effect economies.

(*h*) Smelting materials: All fuel and flux charged into the cupola; fuel recovered from the bed is to be charged again into the cupola. Fuel for other purposes, such as drying ladles, cores, and molds, is to be charged under head *e*.

As the market price of these materials also is apt to vary, and as it is desirable in the analysis to make use of a fixed price, the difference is taken care of by a "market equalizer," as previously explained.

(*k*) Recovered material: This account takes care of all difference between molten iron obtained from the cupola and the salable castings. It is made up of:

1. Equipment: Castings for foundry use, such as weights, flasks, chills, etc.

2. Upkeep: Castings made to repair or replace wastage of foundry equipment.

3. Gates: Gates, cast core irons and frames, sinking heads, and sprues.

4. Wasters: All defective castings.

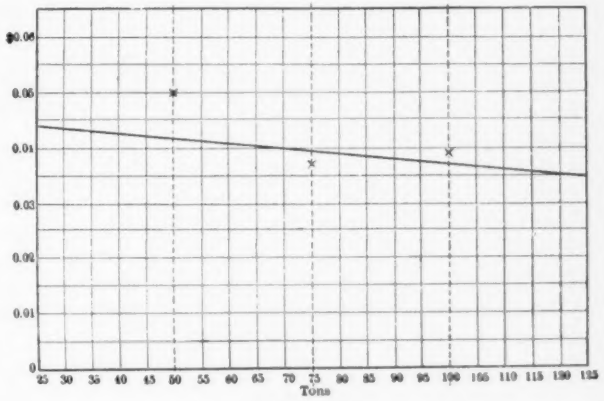
All of this material will either be present in the foundry or will be charged into the cupola as scrap. In the latter case it is certainly to be rated only at the same value as purchased scrap. In the first case it is conservative policy to rate the material no higher than scrap, as it is very questionable whether it would bring a higher return if sold.

As the material for producing the items under this head has been entered as a charge, its value should be credited to the total costs in order to give a true net total cost.

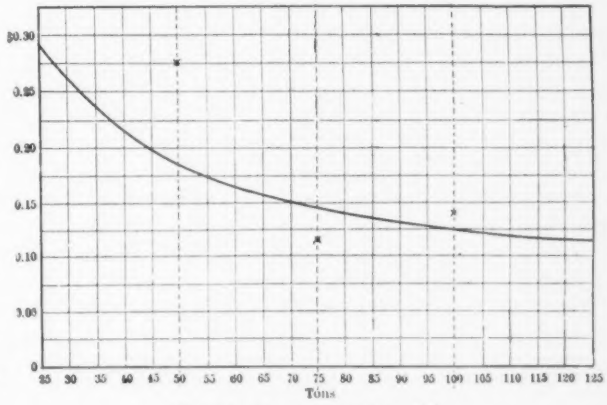
(*j*) Light: All charges directly connected with the shop lighting.

It is to be remembered that the divisions as here cited are merely suggestive of underlying ideas and principles; in actual practice a larger number will be used, and many will be divided and subdivided. The labor charge, for instance, should be split up into direct and indirect labor, etc.

In general it will be most convenient to reduce all elements to a basis of cost per 200 pounds, or one-tenth ton, as a compromise that avoids the high figures for output when figured in pounds and yet allows ready reduction to the pound rate generally used in the sale of castings.



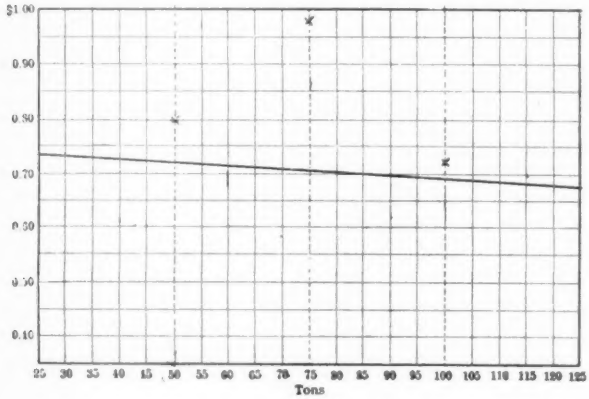
POWER (*d*).



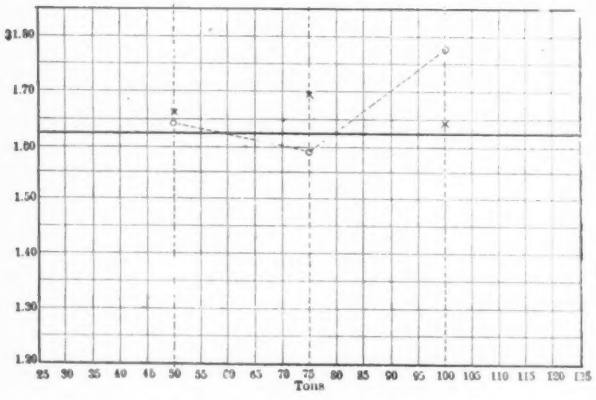
MISCELLANEOUS MATERIALS (*e*).

In comparing costs at different periods it will not do simply to divide the total cost incurred during a week by the total pounds produced during that week and take the result as a pound cost, to be compared with that of some other period. Every manager knows that the cost per pound rises when the product is small and decreases with an increasing output, and will take this into account when com-

paring costs. But such allowance is made as a matter of judgment only. Now, judgment is a very good thing, but certainly is still better if it can be made to take the place of judgment; in this particular instance that can be done and quite readily. As an example, say that the fixed general expense charge for a week is $1,600; with the output 50 tons, the charge per 200 pounds is then $0.80; but for a doubled output of 100 tons the charge per 200 pounds would be halved to $0.40. These



LABOR (*f*).



PIG AND OTHER CHARGING METAL (*g*).

values, plotted as a curve for various rates of output on the horizontal scale, give the diagram *a*.

Similarly, that other element of fixed cost, fixed salaries, is plotted as diagram *b*.

Fluctuating elements of cost are also so plotted, though from the nature of the case the curves cannot be determined by direct calculation, but must be aproximately laid down in accordance with experience and judgment. In this way the diagrams for power (*d*), for miscellaneous materials (*e*), and for labor (*f*) are laid down as decreasing with an increase in production. Pig and other charging metal (*g*) and smelting material (*h*) are laid down as horizontal lines, as these items are not apt to be materially affected by the amount of the output.

All of these curves or lines I term ideal curves. Their total will give an ideal total cost of production, as shown in diagram *i*, by the lower line, per 200 pounds of melted iron. If all the iron melted were turned into salable castings, this lower, or 100 percent, curve could represent also the cost of salable casings. The other curves give the cost of salable castings for the various ratios of such castings to the total iron melted. These curves are determined as follows: Take the total cost per 200 pounds of melted iron as $3.40, the value of recovered iron as $0.20, the salable castings as 80 percent. Then the 160 pounds of salable castings would cost as much to produce as the 200 pounds of iron melted, less the value of the recovered iron; *i. e.*:

Cost of melted iron	$3 40
Value of recovered iron	0 20
Cost of the 80 percent of salable castings is the balance	$3 20

and 200 pounds of salable castings would cost

$$\frac{3.20}{0.8} = \$4.00.$$

This can also be put as a figure to be added to the cost of the melted iron from the equation

$$s = \frac{1}{p} - 1\ (i - r),$$ in which

s is increase to be added to cost of melted iron to give cost of salable castings;

p is percentage of salable castings divided by 100;

i is value of melted iron;

r is value of recovered iron.

Considering in illustration values from diagram *i*: The actual cost per 200 pounds of melted iron is $3.73, $3.09 and $3.00 in the three periods shown. According to the ideal curve, the lower one marked 100 percent, these costs should have been $3.40, $3.07, and $2.90. Running up the first week's cost, the manager finds that of the various items the

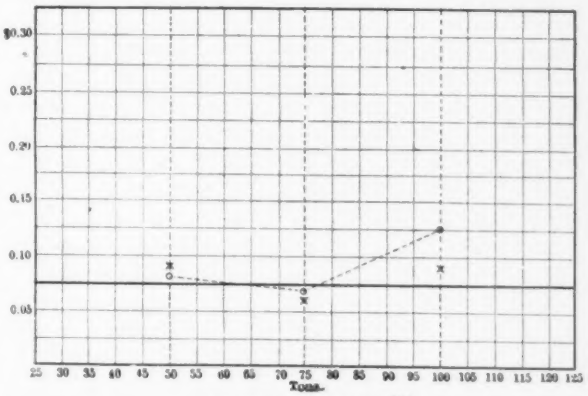
cost for miscellaneous materials (*e*) was by far the higher as compared with the ideal laid down, and instructed the foreman to cut this. Next week the total is still found too high; following this through shows that miscellaneous material cost has been reduced actually below the ideal, but that the labor element (*f*) went up materially; investigation in the foundry showed that the foreman economized on sand mixtures and facings to such an extent as to apparently increase the cleaning labor; the apparent relation between these two elements of cost should be followed up to see whether it is actual: The best way is by a further subdivision of these two elements for some time. As before stated, the analysis is here carried only far enough to explain the idea; nor must the figures given be considered in any other sense.

The following week the total is still found high as compared with the ideal, but more nearly satisfactory.

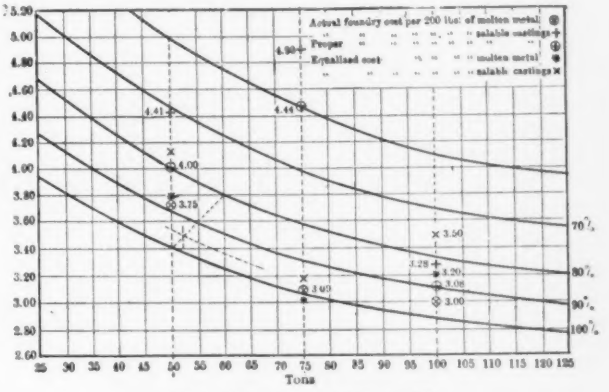
Looking further, the manager finds that the cost of the salable castings is $4.41, $4.90, and $3.28 in the respective periods (entered as + points in the diagram), whereas they should have been but $4.00, $4.44, and $3.08, to correspond with the ratios of 80, 60, and 90 percent of salable castings. The very low ratio (60 percent) of salable castings in the second week is entirely too poor a showing to pass without comment. Tracing upward, it is found that the smelting cost (*h*) was very low, leading to the inference that economy of fuel had led to the very large amount of wasters; investigation in the foundry bore this out, as too dull iron, consequent on the use of insufficient coke, caused a lot of scrapping.

From what has been said it is apparent that this plan of plotting records and methods of analysis based on comparison with ideal conditions keeps the busy manager up to date in his knowledge of what is actually going on, not only as regards totals, but also in detail, so that he is always in position to find a sore spot and apply a remedy based on certain knowledge, backing up his judgment. The method has the further advantage of showing whether the remedy applied really did result in the cure desired or whether it merely brought about a transfer of the sore to some other place.

Knowledge of the fact of such close analysis being made will keep the foreman and others responsible tuned up to concert pitch. It has, in my experience, immediately on adoption resulted in a decrease in costs; showing the foremen actual figures will avoid much of the bad feeling easily raised with well-meaning



SMELTING MATERIALS (*h*).

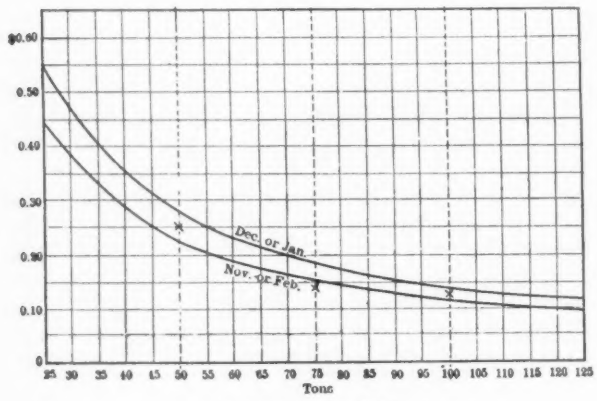


TOTAL COST OF PRODUCTION (*i*).

men when their results are criticized. Being human, they are more or less inclined to ascribe criticism to prejudice. Under this method of absolute analysis responsibility will be placed where it belongs, and it will be possible to bestow praise judiciously in the proper quarter—the old adage to the contrary notwithstanding; "soft words do butter parsnips" to the decided advantage of the firm.

In enumerating the elements of cost, mention was made of a market equalizer to take into account the fluctuating value of the materials

bought; this is brought in as follows: The actual unit value of material used at any time is its average cost price; this may, according to circumstances, be either higher or lower than that due to the current market rate or than the ideal assumed. These actual costs of such material are plotted into the diagrams *g* and *h* with the sign O. The actual total costs as modified by the equalizer are also added on the total diagram *i* with the signs * and ×. Consulting this, it will be seen that a recent purchase of pig and coke at high figures had the effect of raising the cost of the last week's output considerably—from $3.00 to $3.20 per 200 pounds of molten metal and from $3.28 to $3.50 for salable castings. The actual utility of separately considering this element is evident, as otherwise the more nearly satisfactory cost of production, so far as under the control of the foundry foreman, would have been obscured. The actual cost due to the market price of the materials being given will allow sales being based on that.



LIGHTING COST (*j*).

Lighting has not so far been taken into account as an element of cost; this because it is dependent upon the season and the weather, conditions that are not subject to control. This variable character would to a certain extent impair the value and reliability of the main analysis for purposes of cost comparison. I therefore prefer to plot it as an addendum diagram *j*, and to consider its influence on costs separately. In determining sales prices this cost item must, of course, be added.

The totaling diagram, *i*, would be too greatly obscured were curves drawn in for more than each 10 percent of variation of salable castings. It is, however, a very simple matter to interpolate points as desired: Say the 95 percent line is required at about 60 tons output. Mark the intersection of any vertical in that neighborhood,—say 50 with the 100 percent curve,—then the intersection of the next heavy vertical at 10 tons farther along with the 80 percent curve; then of the next heavy vertical, at 70 tons with the 60 percent curve; now pencil a curve through these intersections. As 95 is midway between 100 and 90, the intersection of the curve just penciled in with the vertical midway between those cutting the 100 and 90 percent curves will be a point on the 95 percent curve sought. This latter may then be continued both ways approximately parallel to the curves between which it lies.

In conclusion, I may be permitted to point out that this method of cost analysis is not by any means restricted to the foundry, but is applicable advantageously to all lines of work in which the cost of production varies necessarily with some other factor; in most lines of manufacture that factor would be the output. Although rather lengthy to describe, the plan is not at all formidable in actual use. All the data required are assumed as available, being needed for any arrangement of recording costs that may be in use, so that there remains only the work of laying down ideal curves and of plotting in the actual values; this latter operation is a very simple one that can be quickly mastered by the average costing clerk.

It will give me pleasure to answer any questions as to any point that I may not have expressed myself clearly on, or to go privately more fully into matter that time will not serve to take up here.

Discussion.

Walter F. Ballinger.—The value of estimating costs I think cannot be too much emphasized. An incident occurs to my mind; a gentleman was telling me a few days ago of a certain firm that failed in business. Something like two years ago this firm (with whom I am well acquainted) asked me if I could get them the privilege of going through the factory of one of their competitors. I said, "Very likely; I'll see;" so I went to a member of the competing firm and asked if there would be any objection to taking one of his competitors through the building. He smiled and said it depends entirely upon who it is. I mentioned

the name and he said, "Not for a thousand dollars." He gave as his reason for objecting the fact that this firm did not know how to estimate the cost or value of the work they did. Sometimes they would bid extremely high and sometimes below cost, and his firm would fail to secure work where he knew he was reasonably low, because of the firm that did not know how to estimate. The firm that did not know how to estimate has gone up.

H. D. Hess.—I have been very much interested in the paper this evening. There is one point which I fear is somewhat foreign to the subject, but if Mr. Hess will kindly answer I will be very much obliged. It often occurred to me that it might be desirable to have the costs of castings of different weights and grades kept separate. It is evident that within a foundry's capacity the heavier the individual castings, the greater the output. On light work the production would be cut down. Is it considered, in general, that the cost per pound of castings for the week or month will give a fair estimate of the cost of castings of that average weight, or is it usual to differentiate the costs in order to obtain the costs of heavy castings that are comparatively simple; that is, with little core work, and the costs of light castings, either simple or more complicated

Mr. Hess.—It cannot be said that there is any generally recognized practice of foundry cost keeping. I think the foundry is less well taken care of in the matter of following costs than any other manufacturing department. I know that in some foundries cost groups are determined by casting weights, in others the amount of core work is the basic factor, on the general assumption that core work costs more for labor. The fact of the matter is that all of these divisions are too broad. If all castings up to five pounds are classed together, then those up to 50 pounds, and so on, and the costs carefully determined most likely castings only 5 pounds in weight would cost far more in labor than the others. Lumping is not at all fair. It is necessary to get detail cost of individual pieces. That means an amount of work that many foundry managers think totally impossible. As a matter of fact, with a carefully devised system of following costs these may be so collated as to entail almost no extra expense; but such expense, even a quite high one, is justified, as it is almost impossible to overrate an accurate knowledge of all of the detail costs of one's business. It is that which puts one in position to get and to do business at a profit. Usually if the foundry as a whole shows a profit, that is all that is required; under that management a great deal of work will be taken at an absolute and direct loss; but the foundry making the best showing in actual earnings at the end of the year will be that made a profit on all of its business.

The point to be emphasized is that everything must be considered for itself and then in its relation to other things. If, under the grouping system, the five-pound group were a relatively large portion of the total and the result not satisfactory, investigation should point out the five-pound group as in fault. If then the analysis as laid out does not disclose the cause of the fault, that means that a more detailed analysis is necessary for the five-pound series; such detailed analysis might be kept up later or not, as might be deemed advisable. The fact is that it is almost impossible to lay down any specific rule of universal applicability. No routine that may be laid out will permit dispensing with the element of common sense. It will always be necessary to have a man present who knows what he is after and what he is about. That man should devise the general methods of analysis, so that the detail work may be done by a clerk or inexpensive assistant who will lay the results before his chief, for comparison with the ideal; the chief will follow up differences in whatever way suggests itself as best; that best may be a further subdivision in analysis, or it may be sufficient to go to the shop and find the trouble by a talk with the foreman; detail methods will vary with every man and every foundry.

Messrs. Taylor and Gantt have done much in cost reduction. They have taken certain work and resolved that into the time taken for practically each move made; at first sight a good deal of this sounds ridiculous; but Mr. Taylor was able to cut costs enormously to amounts that were considered totally impossible. Personally I have never applied Mr. Taylor's principles at their extreme, but I can see their wide availability. In the drilling of a novice to careful analysis no doubt the time required is a very serious element; but the trouble and cost will be repaid by the increase of output. All analysis must be made in accordance with the interest of the work in hand and not, as is often the case, simply for its own sake. The thing to be avoided is to have a great deal of work carried along in

the head of some one man, and therefore dependent upon his personality. As quickly as possible everything should be brought down to a basis where it will permit of impersonal study and avoid dependence upon any particular individual; there will always be a field for the resourceful and forceful man without burdening him with duties that merely take up time that he could devote to work that cannot be delegated to others.

E. H. Mumford.—I want to add my word of praise for this paper. I remember that there was a paper read before the Mechanical Engineers' Society some years since on foundry costs, in which the molders' pay-roll was made a basis of estimate and a ratio to fixed charges established with that as a factor. I think the paper (I have forgotten exactly how it went(—I think it advocated taking a previous year's experience of the ratio to fixed charges of the molders' pay-roll as a basis of estimate for the current year's business. A mere contrast with the very broad conception of such a scheme as this of the very nicely detailed conception of Mr. Hess's, shows how much closer he is getting to the real question. It seems to me that to handle the subject of costs in the full detail that Mr. Hess does shows us the difficulty of this problem of estimating foundry costs. Instead of attempting to establish any broad ratio, Mr. Hess studies each detail by itself. Probably in the same way the thoroughly experienced and competent foundry foreman gets at the subject. He has in his head, from his long experience, each detail that Mr. Hess, for the benefit of all of us, has put on paper, so that he can apply to his particular work, without thinking very much about it, the various curves which he has in his head and get at the result which anybody not so equipped could not get at; and it seems to me that Mr. Hess's paper will furnish a good many of us with tools to use in estimating foundry costs. I remember, when I had charge of a large foundry, receiving a letter from a New York club, from the proprietor of the foundry, saying he thought I had too many nonproducers, reminding me that the only man in the foundry who made money for his employer was the molder. He had discovered that I had two carpenters, and wanted to know what a carpenter had to do with an iron foundry. It is quite easy to suppose carpenters are important items of expense if a casting, say, of a large bed plate, is to be bedded in the floor. Even the lumber used would come into play and perhaps the teamsters' union. The practical estimator would take those things into account at sight, but the very first week of an experience of that sort would show a discrepancy from Mr. Hess's curves, which would then be looked up and traced to the making of big wooden cope flasks. It seems to me that Mr. Hess's paper is valuable in pointing out the enormous rambling detail of foundry expenses, and the easy way he has found for systematically keeping track of them.

Mr. Hess.—I may say that I was forced into this idea of analyzing costs on the basis of variation in output. At the time I had under

FIG. 1.

my charge a rather large establishment—the German Niles Tool Works, of Berlin, Germany—and unfortunately by the time we were ready to put our product on the market the bottom had dropped out of business generally. In attendance on the decreasing output our costs were going up continually; every foreman and sub-foreman placed the blame on the outputs going down all the time. We all know that is a good excuse; but the costs were increasing faster than seemed to me justified by the decrease in output. In laying down my "ideal curves," I called in the so-called "foundry engineer" (in Germany every man

must have a title, and his was "foundry engineer"). At the end of the very next period the costs were found to have decreased in despite of a decreased output, and that without having carried through the analysis in detail of any one item. The mere fact that there was a figure based on output to which the "foundry engineer" would be strictly held,—and not only he, but all others,—operated to have all costs and times checked much more closely and to bring about a reduction of total costs; so that an arrangement of this sort has a twofold value—that of so fixing and locating responsibility that each man knows there is no crawling out of it, and then after that element of irresponsibility is eliminated, of showing just where advantageous changes should and can be brought about.

BOSSES ON THIN CASTINGS.

BY JOHN M'CUNE.

When it is necessary to cast a boss which joins thin metal it is sometimes difficult to produce a steam tight casting. Fig. 1 shows a steam separator body with two bosses for receiving the steam connections. The casting itself is a little less than 3/8 of an inch thick. The bosses are about 2 inches in diameter. At first an attempt was made to cast these bosses

FIG. 2.

solid and then subsequently drill and tap them for the pipe connections. When the fittings were attached and steam pressure turned on, nearly all of the castings leaked at the union of the boss with the thin metal. Fig. 2 shows a photograph of a casting in which the upper boss has been broken off and it will be noticed that the iron immediately below the drilled hole is exceedingly spongy and open. Fig. 3 shows the photograph of a casting from which the lower boss has been broken off and it will be noticed that in this

FIG. 3.

case the lower portion of the fracture is very spongy.

These bosses gave so much trouble that from three to four castings out of every five had to be thrown away. They tried casting a piece with the boss down, casting it with the boss up and a riser on it, but all to no avail. The matter was finally solved by turning the boss down in the mold and introducing a core of as large a size as possible, that is, the through hole was entirely cored, and only a little drilling done to clean up the end which was to receive the pipe tap. The practical result of this expedient was to substitute a short cylinder of iron for the boss, so that cooling proceeded both from the inside and the outside. This insured firm metal about the core and prevented the troublesome leaks which they had experienced in the past.

It was considerably more expensive to make the castings when using the small core than it would have been to have cast them solid and drill the holes, providing the troubles above mentioned could have been avoided without recourse to coring.

The Brylgon Foundry Co., Reading, Pa., expects to have its new plant at Newcastle, Del., ready for occupancy in May. The present output will be tripled.

SOME USES FOR OLD CRUCIBLES.

BY J. F. BUCHANAN.*

Plumbago crucibles are an important item in brass and steel foundry expenditure, but, as the expense is a necessary one, it behooves the practical tradesman to be careful how he uses them. I can answer for my own method as being both safe and economical. Our standard number of heats for melting brass in crucibles is thirty-four. I fancy I hear a snicker go round at the modesty of the figures. Someone is sure to exclaim: "Oh! we can get forty heats on an average and we have had '50 not out' on more than one occasion." I believe that, because I too have had the same pleasure. When I say that the standard number of heats with us is thirty-four, I mean to imply that we look upon that number as the minimum we should get with ordinary usage. We melt seventeen heats per week from each furnace, and every crucible we put in is expected to wear for a fortnight; but under no circumstances do we use one for a longer period than three weeks. When we have had the use of a crucible for a fortnight continuously, we reckon it has paid for itself, and, if at the end of the third week it is still sound, as often happens, the chances of its giving out within the next day or two are too great to make it worth while risking the loss, danger and annoyance which always accompanies a "burst," either in the furnace, or out of it.

J. F. BUCHANAN.

Many furnacemen make a practice of "sweating" the pots by putting them, mouth downwards, back into the furnace every night after the last heat, ostensibly to keep them clean. I find they can be kept clean much easier and with less wear, by paying attention to the inside wall when skimming the dross off the metal, or at the finish of each heat. When the last heat for the day has been cast, it is always better to empty the crucible and turn it upside down behind the furnace it was taken out of, leaving the back half of the furnace uncovered. This allows the crucible to cool out gradually and voids much of that cracking noise you hear when it is cooled in a draught.

A new crucible should not require "sweating" before the twelfth or fifteenth heat and about every ninth heat thereafter, but much will depend on the nature and condition of the metals to be melted. With clean ingot metal it is easier to have clean crucibles and increase the average number of meltings.

The man who gives his pots a nightly sweat gets them thin and fragile in a much shorter period than the non-sweater. That means his crucibles are more liable to squeeze, split or collapse. Crucible manufacturers may have something to say on this matter,—they may or they may not agree—anyway I shall be pleased to learn how to improve my record or my methods.

The other extreme is reached by the lazy villain who never sweats the pots at all, but leaves the spare metal to set in their bottoms and wonders how so many pots "run" with the first charge in the morning. If, through inadvertence, you should at any time have metal set over night in the bottom of a crucible, take my advice and dump it out before you recharge it. Put some borings or other metal in the bottom before placing the nugget back in the crucible; you can then proceed to melt the metal with confidence and—your favorite fuel.

I have come to the conclusion that much sweating saps the life of the pot, (just as it would the potter were he amenable to the process) and the "Sweating System" is good for neither pots nor people. But, here am I moralizing on the treatment of sound crucibles when, according to the heading, I should be noticing some of the uses to which old ones, or wasters, may be put. The career of a crucible is often times an instruction; when it has rendered good service and worn itself out as a melting pot it may still be utilized for many purposes undreamt of by the makers. One has only to look around one of the jobbing foundries to realize this: there you may see the crippled-crucible-swab-pot, or the plumbago parting sand dish, and if you happen to know in which suburb the manager

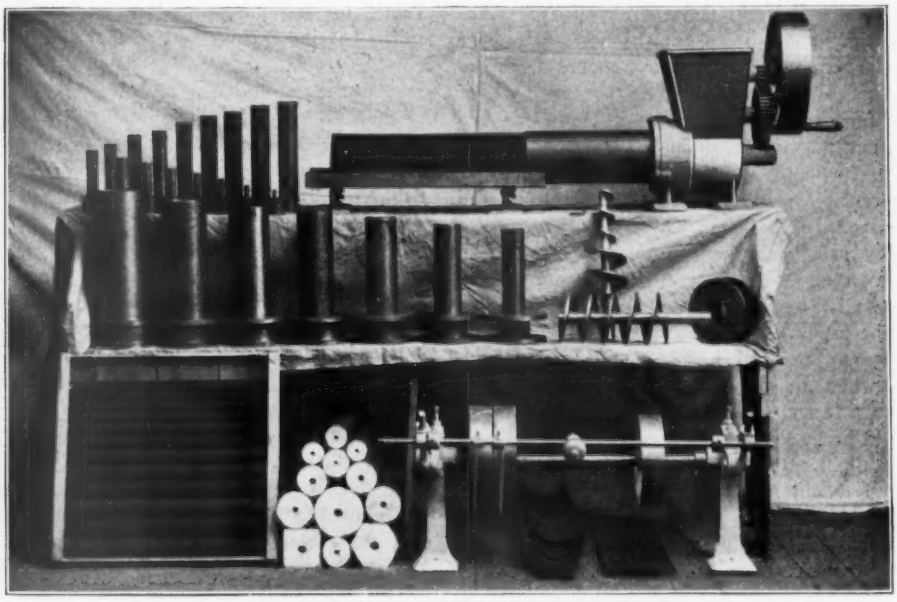
*J. F. Buchanan was born in Glasgow, Scotland, in 1866. He served an apprenticeship in his father's place of business as a brass molder. After he became a journeyman he took employment wherever he could get it, mostly in the large shops on the Clyde. In 1894 he became foreman and ever since has been in charge of work. In 1901 he left Blair, Campbell & McLean, Glasgow, and went out to Australia in charge of the brass department of a plant in Sidney. Mr. Buchanan is the author of several books on foundry practice and of a large number of articles, many of which have appeared in *The Foundry*.

lives you may tell his house by the sable flower pots in the side passage. There is no great novelty in any of these adaptations and it requires no inventive ferment of the average brain to discover many similar uses for faithful old crucibles. The genius, being differently constituted, intuitively finds an entirely new use for any old thing; he cuts and carves it to his liking. Witness that original idea for a self-skimming ladle in No. 117 of *The Foundry*. Considering the recipe is as follows: Cut an old crucible in halves longitudinally; when daubing the ladle fix one of the pieces inside near the pouring lip, to form a pocket or division, and there you are! Another good idea is to cut the bowl of one of the larger sized pots, say five inches from the bottom, invert, and place on the fire-bars of the furnace, to be used as a stand for the melting pot to sit upon. This arrangement saves fuel and has the advantage of keeping the crucible always at the same height in the furnace. In the same way old bottoms make handy crucible covers for melting steel, or German silver alloys. I do not pretend to know all the ways in which worn out crucibles can be used; I have seen them used as annealing pots; also for burning parting sand in; and when the sight of them has become tiresome, a last charge of skimmings or washings would be packed into one of them and melted over night. In the morning the staunch old friend would get his death blow; the button of metal would be put on one side, while the remains,—well, I shall have more to say about the remains further on.

Economy is a virtue and I want to instil it by showing that dilapidated crucibles may be put to some more profitable use than the decoration of the foundry dump or truck heap. Even if they are beyond any of the uses already mentioned, they may be ground and mixed in many ways with obvious advantage. In some localities hawkers buy up broken crucibles for a few cents per cwt; and resell them to the facing mills. It struck me as peculiar that the material in a graphite crucible should release so little when it was done with for melting purposes, especially when it is taken into consideration that the heat treatment it receives makes no appreciable difference on the incombustible ingredients. When you cut off the glaze from the outside of an old crucible there is practically no difference in the body of the material; besides if it pays a hawker to collect and resell them to the grinders, why should it not be profitable for the foundryman to grind them himself? Every foundry of any size has a mill and some hair sieves. Let us see what can be made of the stuff anyhow! "Pugging" is a trade name for the soft fire clay, cement or mortar used for repairing chimneys, furnaces, etc. The best *pugging* I know of is ground crucibles (G. C.) mixed with clay wash. The ordinary sand daubing is vastly improved by the addition of a shovel full of G. C. Pure lumbago facing does not adhere well to the surface of green sand molds, but mixed with G. C. and talc up to 20 percent it may be relied upon. G. C. mixed with oil makes a splendid substance for stamping branch cores, or for getting a bearing by making up the space between core and print, or core and core, as the case may be. Steel founders use fire clay in some of their facing sand mixtures—G. C. is a good substitute; it also makes a good mixer for core sands, in brass foundries, wherever the ordinary mixtures are liable to "burn" or fuse. And now I am going to shock some of the old gentlemen who have great reverence for the "bone dry" crucible. Moisture in a crucible before it undergoes annealing generally results in its being "scalped;" but when once it has been thoroughly annealed there is not the same risk if a little moisture gets on the outside of it.

My reason for making this statement will be explained by what follows. Ten years ago I received my first appointment as a foreman brass moulder; it was in Edinburgh, Scotland, and there were fourteen crucible furnaces in the shop. The first morning I was perplexed to see the two furnacemen brushing the outsides of the crucibles with a black looking "slurry," before charging them. A new foreman, if he is wise, does not say much on the first day of his trial. On the second morn- in the same maneuvers were gone through so I ventured to ask for an explanation. I was informed that this had been the practice ever since "Mr. James," came back from France,—(some fourteen months). The mixture consisted of fire clay and our old friend G. C. half and half, mixed with water. A new pot was put in for the first day *au naturel;* after that it got its morning coat of "black jack." The result convinced me that "Mr. James" was no friend of the crucible manufacturer. His method added at least 30 percent to the average life of a crucible. And now I shall close with an idea of my very own, which should either earn me a job in a plumbago factory or the thanks of the man who stirs his metal till the

head drops off the skimmer. To make a stirrer with "black jack," put two strips of wood on a face board, as you would in making clay thicknesses. Let them be 1¾ inches apart and 1½ inches thick. Pack the space with the mixture, which is improved if moistened with liquid core-gum instead of with water; insert a bar of 1¼ inch x ¾ inch iron, raggled for about 16 inches at one end. Slick off the superfluous mixture, allow it to stiffen, unscrew one of the strips of wood and lift the affair into the stove. In the morning you have a home made "plumbago stirrer." Perhaps I have said enough about old crucibles for one sitting. I should be the last man to create a corner in that commodity, and it is more than likely I shall be cornered for some of the points I have given away.



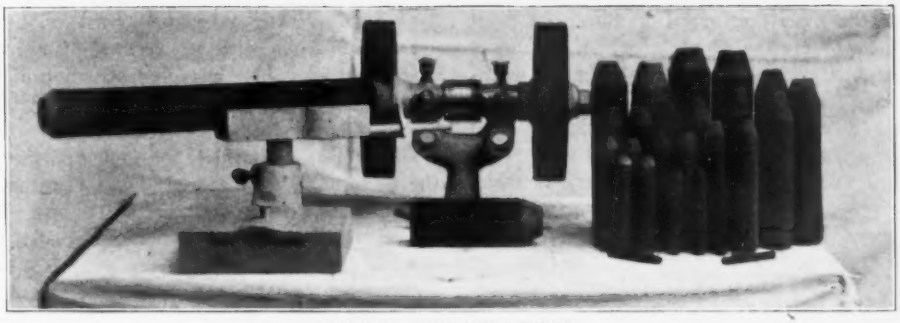
THE WADSWORTH IMPROVED CORE MACHINE.

WADSWORTH IMPROVED CORE MACHINE.

Machine made cores are not new in the foundry trade, but foundrymen are just beginning to realize the saving which can be effected by their use. A number of factors tended to retard the development of the core machine. Prominent among these is the fact that a mixture suitable for making cores by hand in core boxes is not suitable for the general run of machine work, and as a consequence many who have experimented along this line have been led to believe that cores could not be made by machinery as well as by hand. A moment's thought on this subject should convince any one that cores of practically any size should be capable of being made by machinery, provided the machine is properly arranged. A hand rammed core must of necessity be more or less irregular in composition, that is, some parts must be rammed much harder than others, hence the venting must be irregular. In a hand rammed core the material in contact with the surface of the box does not move after it once comes in contact with the surface, but is compressed into form in the position in which it first touched the core box. As a consequence, hand rammed cores can never have a smooth surface unless they are subsequently slicked.

The essential requisites of a good core machine for making large cylindrical cores are that it shall feed the sand into the core in a continuous stream, that the resistance of the core shall be sufficient to insure proper packing or ramming of the core, that there shall be a sufficient slicking action in the dies to produce a good surface for the core, and that the core as it emerges from the machine shall be received upon a properly formed support.

Mr. Geo. H. Wadsworth and Mr. Sherwin invented a core machine some years ago for making small cores. With this machine they were able to produce cores of about two inches in diameter. Mr. Wadsworth severed his con-

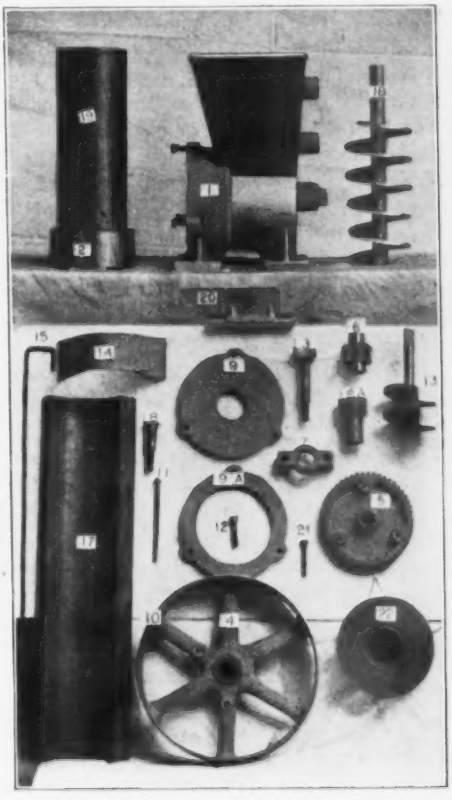


GRINDER FOR CONING CORES.

nection with the Railway Speed Recorder Co., Kent, O., some time ago and became connected with the Falls Rivet & Machine Co., of Cuyahoga Falls, O., and he turned his attention immediately to the development of a large and better core machine. The result is shown in the accompanying illustrations. This machine will produce cores from ⅜ inches up to 6 inches in diameter. All cores have a continuous vent the entire length of the core. This vent is formed by a stationary vent wire about which the core slowly rotates as it passes through the die. As the cylindrical cores emerge from the machine they have a slight rotation which assists in keeping them straight on the receiving plates. For the smaller sizes of cores corrugated iron receiving plates are used, while the larger sizes have special plates which fit about ⅓ of the circumference of the core. These plates are shown at 17 in one of the accompanying halftones. The rest for supporting plates is also shown at 20.

On account of the fact that large cores require a slower motion of the feed screw than small ones, this machine is so constructed that the driving pulley can be taken off from the stud on which it usually works and connected directly with the intermediate gear, thus increasing the speed of the machine in the ratio of one to three. With this machine from 200 to 600 feet of cores can be made per hour. A 6-inch core 24 inches long can be made in less than 20 seconds. The cores are oil cores and require no rodding. The slicking of the surface presents a close surface to the metal, which reduces the tendency of the metal to penetrate the core, at the same time this slicked surface is sufficiently porous to enable the gases to penetrate to the more open portion of the core and thus find their way to the vent very readily.

All stock cores are ordinarily made in lengths of 24 inches. If they are required in shorter lengths for vertical work they are subsequently sawed to the required length and tapered by means of a special grinding attachment shown in one of the halftones. Two emery wheels are provided, so that one can be



PARTS OF CORE MACHINE: 1. HOPPER. 2. DIE BUSHINGS. 3. HAND WHEEL SHAFT. 4. PULLEY. 5. INTERMEDIATE GEAR. 6. DRICING PINIONS. 6A. PINION. 7. CAP. 8. INTERMEDIATE GEAR STUD. 9. CLAMP RING FOR L. D. 9A. CLAMP RING FOR S. D. 10. HAND WHEEL HANDLE. 11. RIVET FOR HAND WHEEL. 12. FILISTER HEAD SCREWS. 13. SMALL SCREW HOLDER. 14. GEAR GUARD (PULLEY STEEL). 15. VENT WIRE. 17. CORE PLATE. 18. SCREW. 19. DIE. 20. REST. 21. CAP SCREW FOR PULLEY. 22. REDUCTION BUSHING FOR SMALL DIES.

set to the taper and length of the lower print and one to the taper and length of the upper print, thus saving time by enabling the workmen to grind both ends of the core without laying it down and without having to stop and change the setting of his machine. It is a great deal quicker and cheaper to make standard cores, saw them to length and grind the ends, than it is to make half cores and paste them together. Then too, the resulting product is very much better and more uniform.

A GLOSSARY OF METAL FOUNDING TERMS.

BY A. E. FAY.

NOTE.—This is intended as supplementary to Bolland's "Encyclopedia of Founding," and to Hasluck's Glossary contained in "The Patternmakers' Handybook," and terms adequately defined in those books are omitted. Some words and meanings that are very little used are included, although there may be better words for the same thing or meanings for the same word.

Annealed Sand.—Baked sand, dry sand.

Arris.—Projecting edge of sand in a mold.

Balance—In figure molding, a large extension of the core forming its base and designed to be imbedded in the molding sand, to balance or hold the core in position, analogous to core print.

Cabbage Pot—A kind of mortar used with pestle to reduce scrap metal, as brass iron, to a ball.

Cake Core—A dry sand core placed so as to form a cover to a mold. This use of the word core is not strictly correct. The fact that a part of the mold is made of dry sand is not sufficient to warrant calling it a core, if it does not have the function of a core.

Cake Ring—A dry sand ring used at the top of a pipe mold in the same way as "cake core" above. This is the better term for this article.

To Camber—In bedding, to give the pattern the necessary deflection in order that the casting shall come out of the sand straight.

Card of Patterns—A series of small half patterns, usually united to the runner patterns and fixed to the pattern plate.

Coping Board—In loam molding, a sweep or strickle used to form the outside and top of the cope or "coping."

Core Board—In loam molding, a sweep or strickle used to form the body of the core.

Cottle—A side of a metal mold.

Crib—Flask for upper part of loam mold.

False Side—A side or section of a mold made hastily, to help in the construction of the mold, and before casting replaced by one more carefully made.

Flat Back—A flat plate with such portion of the pattern rigidly secured thereto as can be readily drawn from the mold.

Ferrostatic Pressure—Pressure created by head of iron.

Filler—A cement used to fill holes in castings.

Gate-Git—Git Head—English term for the passage into a mold through which the metal is introduced.

Gate Cutter—A machine for cutting sprues from castings and also a molder's tool for forming sprue holes in the mold.

Head—Head Gate—Sprue—Ingate—Same as gate.

Janner—Spring Chaplet.

Kellet—Core bar setting for pipe mold.

Kishy—(adjective)—The fretted appearance of metal after being cut or machined caused by defects in the casting.

Match—See Bolland's definition of "Match Part."

Mould—The English spelling of the American "Mold."

Multiple Molds—Multiple Molding—A system of molding, consisting in forming double face mold sections having the impression of a half pattern on each side, and piling them one upon another to form the molds between them in vertical series.

Odd Side—Odd Sand Part—A sand, plaster, or other molded composition held in a frame and used like a match or flat back.

Peen—Pein—Pene—A rammer for molding.

Picks—Air bubbles sometimes found in plaster mold stereotyping.

Picking In—The operation of drawing into or within the external surface of a pattern, a movable part which projects to form an undercut place in the mold.

Picker Out—A pointed and hardened steel wire used to repair molds.

Print—Indentation in the mold formed by the print on the pattern to receive something to be set in the mold.

Printing Back—Punting—Returning a pattern to the mold to slick and finish the surface, the pattern being first coated with black lead.

Returning—Same meaning as printing back.

Ridge—Central runner.

Rowel—A ferrule or ring of sheet metal

made slightly larger than the core print and embedded in the sand by slipping it over the core print and ramming it up with the pattern. It is used as a support for the core.

Runner—Passage for the molten metal leading from the sprue or ingate to the mold.

Runner Head—Gate or Sprue.

Seating Board—In loam molding, a board or sweep used to form the seating or bearing at the bottom of the mold on which rests the cope.

Silhouette Plate—Stripping plate.

Slot Plate—Stripping plate.

Slurry—Black sand and clay wash for molds.

Slackening—Loosening or removing part of a core or mold to permit the casting to shrink without cracking.

Springer—Spring Chaplet.

Stool—In a molding machine, a rod or plate projecting up into a mold, usually through the pattern, and designed to support some part of the mold as a green sand core, when the pattern is drawn. It is really a species of stripping plate.

Stool Plate—A plate to support one or more stools in a molding machine.

Tedge—Ingate for metal mold.

MOLDING MACHINES.*

The value of a foundry foreman to his employers depends almost entirely upon his efficiency in three directions, first—his ability to work in perfect harmony with his men, and to secure from them their very best services; second—his ability to turn the work out by the time and in the order required, providing other conditions will permit; and third—his ability to produce the best castings at the lowest cost, and there is no appliance or equipment that can be placed in the foundry which will as effectually assist him in this last named direction as the molding machine. This may not generally be known, but it is, nevertheless, a fact which is being demonstrated in many of the up-to-date foundries throughout the United States, and especially in our own city.

The advantages over hand work resulting from the use of molding machines, are: First, increase in output, and second, the superior quality and uniformity of the castings. In the average jobbing and machinery foundries machine molded castings can be delivered to the machine shop at just one-quarter the cost of the same castings, if molded by hand, for in addition to the saving in the cost of molding there is also a great saving made in the cost of cleaning and finishing, for castings made on machines require practically no chipping nor filing, a little milling making them perfectly clean and ready for use.

When contemplating the introduction of machines, there are several points which should receive the most careful consideration, such for instance as durability, simplicity and accuracy which three combined effect efficiency. From experience I find that the draw plate machine, when fitted up properly, is very well adapted for the general run of foundry work. Patterns and plates for these machines can be made of either wood or iron, depending upon the number of castings required. Wooden patterns and plates give excellent service and can be very easily and rapidly prepared. A little explanation of this method of fitting up the machines may be useful to those who are interested.

Both patterns and plates should be made of close grained, well seasoned hard wood. The cope and drag of the pattern should be temporarily fastened and trued up together at the parting to insure perfectly similar outlines. The stripping plates should be composed of strips of wood about 6 inches wide, the thickness depending on the size of the machine to be fitted. These strips should be glued together, the grain of the wood being reversed for ends and sides, to eliminate all possibility of shrinking, and corrugated fasteners driven across the joints to give additional strength. The first wooden plate should be planed and fitted with pins for the flask, located at exactly the correct distance, the outline of one-half of the pattern should be marked upon it in its proper position and the plate cut out around this line. Pattern supports, made of well seasoned pine, are screwed to the yoke of the machine. The stripping plate is temporarily fastened to its machine and the pattern dropped through the opening and screwed onto the pattern supports.

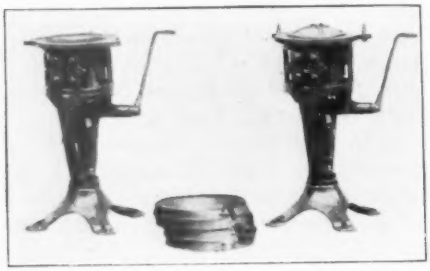
To fit up the other half pattern to conform to the pattern and plate already made, the first stripping plate is removed from its machine and laid upon the unfinished plate, the pins in one fitting into holes drilled in the other. The opening in the first plate is carefully marked upon the second which is then cut out; in this way the openings in the plates are made exactly alike. Both plates are next fastened to their respective machines, the second pattern is

*Paper read before the Chicago Foundry Foremen's Association, by George C. Nielsen.

dropped through the opening in its stripping plate and screwed to the pattern supports. By this method the whole operation of mounting patterns, whether of the simplest or most complex nature, is performed without the use of a scale or measurement of any kind, and the patterns are located so perfectly that there will be no off-sets of any kind on the castings. Gate forming pieces are screwed to the stripping plates and sprues with telescoping buttons are used so that when the sand is struck off from the cope this piece can be taken out, leaving a perfectly formed sprue.

In some foundries an iron frame which is cut out in the center to within a distance of say 1¼ inches of all sides to receive the wooden stripping plate is used for supporting the flask.

To illustrate the durability of these wooden patterns and plates I would say that I have in the foundry machines that were fitted up over two years ago. Hundreds of castings have



MACHINE FOR MOLDING A HAND WHEEL.

been made from them yet they are now in as good condition as the day they were sent down to me. I know, too, from experience that patterns fitted in a machine will outlast three hand patterns which are soon rendered worthless by the continuous rapping which they receive.

The cost of making patterns and plates for the machines depends almost entirely upon the nature of the work, some patterns being quite complicated, and others exceedingly simple. I can say this, however, that on an order for castings requiring three days to be molded by hand, the patterns can be fitted up in the machines, and the cost of molding the castings and making the patterns and plates, including the cost of materials used, will not equal the cost of the three days' work of molding by hand, so that after the third day the saving effected by increased output and the use of cheaper labor is a clear gain. If the pattern is one that is run either continually or at intervals, the outfit of stripping plates and patterns must be considered in the light of an equipment and not an expense.

The average saving in the actual cost of molding which the draw plate machine is able to effect I find runs from 50 percent to 60 percent, although from my own experience I know that greater savings than these can be made. I have in mind just now a hand wheel for a copying press. This pattern is fitted in a set of 10-inch round machines, the rim and arms are both round and the parting is in the center. I have a few photographs here showing the machine and the way the job is fitted up. One laborer makes 25 complete molds in 1½ hours at 1¼ cents apiece, whereas when made by hand they would cost 5 cents, as a molder puts up only 60 flasks for a day's work. On this one job you will see I save 3¾ cents a flask, or 75 per cent. I have another job in the foundry now, consisting of castings for a large press, which is fitted in three sets of machines. One man puts up in a day 12 flasks from each set, the total weight of the castings amounting to 3,500 pounds, which I am sure it would take at least four molders to put up on the floor.

By far the best results can be obtained from the machines when operated by ordinary laborers. A laborer learns thoroughly how to do just one thing and that he does quickly and efficiently. His ignorance in other directions is an assistance and not a hindrance to him, for a floor molder, if his mold drops, starts at once to patch it, whereas the machine operator not knowing how to do this, shakes the mold out and rams it up again in less than half the time that it takes the molder to patch his. A machine operator will also set cores in the one way which has been taught him much quicker than a molder will, who always has his own ideas as to how things should be done.

A few words regarding the utility of the machine I think will be quite interesting to some of us. Only a few years ago we considered that their usefulness was limited to flasks up to about 18 inches, but gradually their scope became broader and broader until to-day we are building machines for molding castings weighing 13,000 pounds; these machines weigh about 2 tons each and will take flasks 5 feet by 10 feet. Machines for molding castings such as large dynamo beds and boiler sections measuring up to 60 inches in width, fly wheels 60 inches in diameter and electrical machinery

parts requiring draws of 28 inches are being installed throughout the country by all the well known manufacturers of these different lines. An interesting case has just been brought to my attention of a foundry in which a set of the large machines mentioned above have recently been installed for molding some patterns from which only 3 castings were required, which speaks volumes for the utility of the machine, when there is not the heretofore considered necessary great duplication of work to be made. These large machines are being operated quite extensively now as a turn-over machine; they are fitted on the sides with trunnions so that after the drag mold has been rammed up, the machine is lifted up by a quick acting crane, turned right over, the pattern is drawn upwards and the machine and pattern returned to their original position. This you will see obviates the necessity of barring the drag flask and in the case of an exceedingly complicated pattern having deep pockets to be molded, a perfect mold is insured which might not be obtained if the flask were lifted from the machine and turned over according to the usual method. It would not, therefore, be amiss for me to say that the machine can be used to advantage for molding any casting, regardless of size, that can be molded by hand.

To the Editor of The Foundry:

The Cast Iron Notes by Mr. Keep are always interesting reading and a great many valuable suggestions are given in them. But now and then there is a direction given, with authority doubtless, but the *Foundry* reader would like to know why Mr. Keep does so.

For instance in the notes on slagging a cupola he says, "do not use lime with the first charges."

Some of the progressive foundrymen in Buffalo would like to know why not? In an investigation carried on by the Foundrymen's Laboratory at the Buffalo Foundry Co., and published in your last number it was found that lime was extremely good in the first charges and in all the charges.

In fact the large bed of coke in the cupola needs fluxing by lime. There is often 10 to 12 percent of ash which should be slagged off, considerable sulphur which will be absorbed by the lime. This is true likewise of the first charges.

We are adding about 1,000 lbs. of lime in our 66-inch cupola to the bed and first three charges and find it gives excellent results and so we ask, "why not use lime in the first charges?"

Again Mr. Keep says, "do not tap the slag until 10 tons of iron are poured."

Why not? What is the use of keeping a great amount of cinder in the cupola?

In running a small cupola a (48-inch) that would mean don't tap the slag at all for a 10-ton heat. Then you would be obliged to let the accumlating cinder run into the ladle with the iron or else run into the tuyeres.

It is the practice here to open the slag hole as soon as the slag reaches the level of the hole and allow it to run continuously if possible. The cinder will often run after the second ton of iron is poured.

Again Mr. Keep says use about 40 lbs. of limestone to the ton of iron. That is doubtless a very good general rule and gives good results. But often the coke is high in ash, or high in sulphur, or wet; then 40 lbs. to the ton is not enough. If the iron is very sandy and the runners and gates are dirty much more lime is needed, 60 lbs. to the ton would be much better.

Mr. Keep's advice to use the lime upon the coke is excellent and corresponds with our practice here. To figure the amount of limestone upon the coke used would be an improvement.

The Foundrymen's Laboratory is interested in testing many practical directions, to find out whether they are the outcome of intelligent experiment or are simply rules of thumb for which no one can give an explanation or a reason.

N. W. SHED,
The Foundrymen's Laboratory,
Buffalo, N. Y.

The Eastern Iron Co., Meriden, Conn., recently incorporated, will take over the plant of the Meriden Malleable Iron Co. The plant has a large foundry and well equipped which has been idle for several years.

The Perkins Machine Co., of South Boston, Mass., has purchased the property at Warren, Mass., formerly occupied by the Slater Engine Co., and will remove to the latter place. Additions will be made to the machine shop and foundry.

The Holland Development Co., New York, has been incorporated with a capital of $30,000, to manufacture tools, machinery, etc. Directors are: M. E. Gates Jr., New York; A. B. Triggs, Brooklyn, and V. Lindsley, New York.

SCRAP

A MOLDING SAND DIFFICULTY.

When any one attempts to run a foundry in a new country he is confronted with many difficulties. One of these is the molding sand problem, which frequently is a troublesome one, especially in a country where clay predominates and sand is an extremely scarce article. Some years ago two small foundries were located on opposite sides of the street in a western town. Both of them obtained their molding sand from a distance. One of the foundry properties backed upon a water front; and in connection with some improvements being made, when one morning a tramp lounged in asking for work, the foreman of the foundry put him to digging a hole in the bank back of the foundry. After working a short time the fellow came to the foreman and called his attention to the fact that there was a small streak of sand in the side of the bank which looked to him "just like the dirt they were hauling in on the cars." The foreman took some of it into the foundry, tested it, and found it was, as the tramp had thought, molding sand, and of good quality. He told the man to get all he could of it and wheel it up and put it into the sand shed. He then forgot about the matter entirely.

A little over a week later in passing the sand shed he noticed that it was as full of sand as it could hold, which surprised him considerably. He called up the man who was still working at the excavation, and asked him where he got all that molding sand. He replied that he had followed the seam back into the bank. The foreman then went to the bank and found that the workman had excavated so far that he had a tunnel, following the seam out of sight into the bank. While they were talking, from the rear end of the tunnel, out came the foreman of the foundry across the street, and a madder man it would be hard to find. He wanted to know (with a little brimstone vocabulary) what on earth they had been undermining his foundry for! Bewilderment was succeeded by explanations and upon investigating the matter they found that the tunnel extended across the street and under a corner of the opposite foundry. The rival foundry had just completed an extra large mold to their satisfaction, when they were mystified and chagrined to see it crumble, lose its shape, and sink into the earth. The foreman thought this was a seismic disturbance that demanded scientific research, and that at once, and exploring the operations had come through to the opening of the tunnel.

Considerable difficulty was experienced in settling up the matter, but it was finally arranged that the foundry which had dug the sand should deliver half of it to the other foundry and that they should also fill up the hole. As a consequence, one foundry got a good supply of molding sand for nothing and the other one was put to quite an expense to fill the tunnel.

A Little Water Did It.

McIntyre's foundry came near being blown up the other day. Casting operations had just been completed and the remaining iron and coke was dumped as usual. As soon as the hot mass touched the earth there was a terrific explosion which scattered hot iron, fire bricks, cinders, etc., in every direction. There was a little pool of water under the cupola where the stuff was dumped which was the cause of the blowup. Three men were in the casting room at the time and had narrow escapes. The cupola in which the iron was melted is a total wreck and the windows in the building were also blown out.

A Busy Foundry.

The Victor foundry is shut down today to allow the men to accumulate a stock of fish stories. The weather was so spring-like this morning that the men were seized with a violent epidemic of spring fever, which incapacitated them to such an extent that they could not work.

It is reported that they met later at the home of Sam Gibson and went in a body to the creek north of the city, armed with fishing tackle and bait.

New Wood Foundry.

Port Townsend has a new wood foundry, where steam power will be utilized for cutting stove wood. It is located on the old Eisenbeis dock on upper Water street, and is owned by Harry Garfield, H. C. Halden, Ed Sims and Ed Christian. The steam saw was put in operation yesterday for the first time and attracted many spectators. The wood, in

16-inch lengths, will be cut from logs taken from booms to be towed here from Hadlock, Scow Bay and Oak Bay, and it is announced that sufficient logs are now on hand to cut 600 cords of wood.

The above-mentioned foundry is of a new class, so far as our knowledge of foundries is concerned, but we presume that it belongs to the same general class as the old and well known "pie foundry."

POINTS FOR BRASS FOUNDERS.

BY A PRACTICAL TRAVELING MAN.

Your white metal for patterns is all right. It just saved me a few dollars on a rush job. Now, you are all over the country and have a large acquaintance in the brass foundry business. Do you know a good man who is out of work that understands tending furnaces and melting metals? Excuse my pert answer, but no good man is never out of work. If you wish a man to fill the position, steal one; good men can only be obtained by special inducements. Just make known your wants in *The Foundry* and you will come in touch with the man you are looking for. It has often made me feel sorry to hear a man say that any ordinary laboring man could tend brass furnaces, when it requires brains. This is just the place where the profit and loss account is made to read either on the one side or on the other. Take my advice and get the very best man you can to tend your furnaces and he will earn you money by keeping the metal in the pots and not up the stack.

Glad to know you secured the work from the railroad company. If you make the driving boxes, gibs, side rod boxes, and the engine and tender truck boxes from this formula, 80 parts copper, 10 parts lead, and 10 parts phosphor tin, you will give them a metal just what is needed for wear and service. You can use scrap copper in this composition, for where you use phosphor tin you are sure of a purified metal, as phosphorus eliminates all of the oxides and gives you metals equal to new materials. Another excellent bearing metal, a trifle cheaper, but which gives good service, splendid for its cool running qualities, is made as follows: Seventy parts copper, 20 parts lead, 10 parts phosphor tin. In pouring this metal it will be necessary to keep it well stirred, as the lead content being in such large proportion, has a tendency to separate, as the mixture is a mechanical and not an affinity one. This metal must not be poured too hot. Another good point with this metal is to shake out molds and plunge into water; this sets the lead contents and prevents bleeding. It would take up too much of your time to explain how these little particles of metals act when combined together.

Now the general engine castings should be of a good quality of red brass. By using 80 parts copper, 10 parts spelter, 5 parts tin and 5 parts lead, this mixture will fill the bill to perfection for all ordinary engine castings.

About the freight car boxes—it will take a longer time to explain this branch of the business than what you think, so will have to say good-bye until we meet again.

COMPOSITION CHAPLETS.

I wish to ask the readers of *The Foundry* a question or two in regard to brass and composition chaplets for heavy brass castings. Can any one give a rule for determining the size and material of a chaplet in relation to thickness of the casting and the metal of which it is to be poured. We want a chaplet that is absolutely sure to withstand the action of the metal while being cast, that is, something that will not melt away and allow the core to be displaced. At the same time, we want something that will fuse together with the casting so as to withstand a water pressure of from 100 to 2,000 pounds per square inch.

As near as the writer can judge from his experience of nearly 20 years on heavy brass castings, brass or copper chaplets are not to be depended upon. They will either melt away and allow the core to get out of place, or they will not fuse and unite with the casting, and thus cause a leak where they are placed. Many of the readers may not agree with me, but I take the ground that it is cheaper and better to use wrought iron chaplets in heavy brass castings and if so desired, to drill them out afterwards and insert brass plugs in their place. This procedure will make a sure job and prevent leaks.

Hoping to hear from others in this matter, I remain Yours,

A READER.

The Board of Trade of Connellsville, Pa., received notice from the Fischer Foundry & Machine Co., of Pittsburg, that the company has decided not to move its plant to Connellsville. The city offered a cash bonus of $25,000, but the company could not obtain a suitable site.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

Bath Tubs.

Question. "Do American founders pickle their cast bath tubs in hydrofluoric acid previous to enameling or do they simply clean with the sand blast?

"What is the best composition of pig iron suitable for this purpose?"

Answer. The pig iron should contain the lowest silicon that will allow the iron to fill the mold. The whole trouble is with the graphite that silicon dislodges between the grains of the iron. Any wet pickle will soften the surface of the metal. This cannot be washed off, and small cavities will be filled with softened graphite. Sand blasting, which is the universal practice, will pick out the particles of graphite and leave a clean metallic surface for the enamel. Any way, you do this work, it is one of the most difficult that the founder has to contend with.

Sprues and Scrap.

Question. "What is the usual percentage of return or remelt in a well regulated shop? What percent is the sprue alone? What is a good analysis for light machine castings, such as sewing machine or even lighter castings?"

Answer. In a stove foundry running on a general line of stoves from 38 to 40 percent of remelt would be right, 35 percent would be sprue alone. If the work is lighter the remelt may increase. For light machinery, silicon 2.20 to 2.80 percent, sulphur .085 percent, phosphorus .70 percent, manganese .70 percent. For stove plate, silicon 3.00 to 3.25, phosphorus 1.00, manganese .60 percent, and sulphur will be about 0.90 percent.

Iron Chilling on Sides of Cupola.

Question. "In melting I have so much ratler iron left; the iron seems to chill on to the sides of the cupola under the tuyers and when the bottom drops there is a big lot of small pieces of iron mixed with the remaining coke."

Answer. If you melt iron hot there will be no chilling on the sides of cupola. Get the cupola hot before you put the blast on and be sure that you have enough bed to get hot iron.

Cupola Loss.

Question. "Which of the following methods is correct for figuring loss:

On a six days' melt—

	Pounds.
Pig iron charged	36,000
Scrap charged	15,000
Remelt	9,000
	60,000
Yield—	
Good castings	40,000
Scrap	6,000
Foundry castings	2,000
Remelt used once	9,000
	57,000
5 percent loss	3,000
Or the following—	
Pig iron scrap and remelt	6,000
Good and foundry castings and scrap	48,000
Remelt on hand at end of week	3,000
	51,000
15 percent loss	9,000

"Do you base the percentage of good castings on the total put into the cupola or on the total castings pound?"

Answer. Neither is correct. To figure loss you must take an exact inventory at the beginning of the work of all your own scrap iron that may be put in the cupola during the week, not counting pig iron and foreign scrap.

Carefully weigh throughout the week all pig and foreign scrap and remelt, charged and weigh all castings produced aside from remelt. At the end of the week make an inventory of all remelt on hand. Add together all pig iron and foreign scrap charged during the week and the remelt inventoried at beginning of week. Subtract from this all good castings made and the remelt left over at the end of the week and your loss should be about 5 percent. If it is more your weights are not correct or else you are throwing away iron in your cinder. It is very difficult to figure loss as there are leakages that cannot be located. The loss on a very small melt is much greater than on a large melt, for the reason that the loss is chiefly in iron thrown away in the drop from the bottom. Base the percentage of good castings on the total melted or on the total pig and scrap charged as you choose.

Aluminum in Iron.

Question. "Will aluminum mix with cast iron by putting the same in a ladle? It seems to me that the difference in the specific gravity will interfere with the proper mixture."

Answer. It instantly forms an alloy, and the aluminum can never be separated from the iron again.

Axle Boxes.

Question. "In our last cast 50 percent of all made were bad through the casting, blowing off the mandrel used to form the hole. We have tried coating the mandrels with tar and plumbago and oil. We find that all such wheel boxes seem to be made on mandrels. We use all scrap iron, would that have anything to do with it?"

Answer. An axle box is a hard thing to make. Why don't you use an oil core so as to save your work until you learn to use the mandrel successfully.

To Mold a Camp Stove Cover.

Question. "I have a number of camp stove lids to make which are exactly like a pot cover with a 3-inch crown. The cover is 3-16-inch thick and 13-inch diameter. Is this job suitable for a snap flask? Which side up should it be made? Where should it be run and how many should a molder make in a day?"

Answer. The job must be made in a flask on the floor. The concave side should be up. If you can keep the surface smooth enough, run it with one flat sprue at the center, but by gating it at the side you will have a smoother casting. The number per day will depend upon the molder.

Mixture for Pump Castings.

Question. Can you tell me a good cast iron mixture for pump castings, hydraulic accumulator castings, etc.?"

Answer. For heavy work make a mixture with 1.20 to 1.50 percent silicon and less than .09 sulphur, .60 phos., and .80 man. For medium work, 1.50 to 2.00 silicon, less than .08 sul., .60 phos., and .80 man. There is no use giving the names of irons. Irons made from Lake Superior ores make strong castings, and if also made with charcoal the castings will be much stronger. There are quite a number of other irons that have a great reputation for imparting strength. If you will charge cast iron borings in your cupola as explained in my book "Cast Iron," p. 131, you will increase strength 20 percent and will make a very close grain.

Stove Plate Mixtures.

Question. "What brands of Southern (Alabama) pig iron are most commonly used in stove foundries and what percentage of scrap is usually mixed with it for first-class product?"

Answer. The irons made from all red ore are best because they are non-chilling. There are a very few brown ores that produce non-chilling iron and 25 percent of such ore and 75 percent of red ore make a good stove plate pig iron.

Ask such a company as the Tennessee Coal, Iron & R. R. Co. to guarantee an iron from all red ore and you will get it. You will be obliged to use some silicon iron to soften. If you use No. 1 and 2 soft and No. 2 Foundry you can use 10 percent stove plate scrap, but it is about as cheap to use 10 percent No. 4 pig iron.

TESTING CAST IRON.*

BY DR. RICHARD MOLDENKE.

The study of cast iron as one of the important factors of our industrial economy is becoming more general at the present day, every side of the problem receiving attention by expert investigators. As the result of a long-felt want among buyers of castings, and the increasing information acquired by the manufacturer, there has recently been inaugurated a movement toward the adoption of regular specifications upon which the product of the foundry may be bought and sold.

As this movement toward a fixed basis for valuing cast iron and finished castings has every indication of a successful termination, we are justified in placing this interesting and many-sided material in the category of the things we know something about. And yet it is only in very recent years that the direct application of chemistry in foundry work has explained what occurred during the melting and casting process, has allowed the making of new and delicate combinations, and tended toward a more systematic exploitation of the various classes of metal handled daily.

As we expect to go into the methods by which cast iron may be tested in regard to its quality, it would not appear out of place to enlarge a little upon the metal itself, bringing out the points which have a direct bearing on our study. Cast iron is an alloy in which there is nearly always present mechanically mixed graphite. It consists of iron itself, in which are dissolved the carbides, sulphides, silicides, and phosphides of iron and manganese, besides small quantities of other ingredients of less importance. We may in fact call cast iron a steel with a much greater quantity of impurities. Yet these impurities will determine whether the casting will be

*Read before the New England Foundrymen's Association, Feb. 10, 1904.

soft or hard, black in fracture or white, tough or brittle, in fact whether there shall be shown opposite qualities of various kinds, with all that this means to the founder who aims for one kind of metal and occasionally gets quite another.

The Metalloids.

Of the elements carbon, silicon, sulphur, phosphorus, and manganese, prominent in the order named, which are found associated with the iron in our castings, the carbon present is by far the most important. Whether it is mechanically mixed as graphite, or present in the form of an iron carbide, will depend upon the amount of silicon in the metal, together with the rate of cooling from the melted state during the casting process. Now, all cast iron has either a maximum of graphite with a minimum of combined carbon; the opposite state of affairs; or varying proportions of the two; as the sample under consideration has either a fracture which is dead black and is soft, or is white and hard, or varies between these two extremes. Furthermore, the quick cooling of the shell and slower loss of heat in the interior of a casting, means a higher proportion of combined carbon in the outer than in the inner portion, the total carbon of every portion of the casting being practically constant. The bearing of this upon the testing question is seen when the utter lack of homogeneity in the metal, so far as concerns the distribution of the combined and graphitic portions of the total carbon is taken into account. Any chemical determination of either of these two forms of carbon is therefore only an average, and not a specific representation of the actual state of affairs, unless, indeed, minute quantities carefully planed off at given points be analyzed. Hence we will readily recognize the futility of testing cast iron chemically so far as the carbon content is concerned. And yet we often run across specifications for pig iron in which the graphite and combined carbon is laid down as highly important, when actually the total carbon is attempted to be reached.

The next important element is the silicon. This is very evenly distributed in the metal, and is therefore correctly located by the chemical way. It is, however, principally useful for its action on the carbon content. No silicon means all the carbon in a state of combination. Even without the accelerating effect of chills, the iron will be quite white when poured into green sand molds. For thin castings this is the case up to some .75 silicon content. Above this, or where the castings are over ½ inch in thickness, and have taken time to cool, some graphite has been thrown out. Everything else being equal, this separating out of graphite becomes more and more pronounced as the silicon goes up, until about 4 percent is reached, at which point we begin to run into other troubles.

The strength of a casting depending upon the relation of the carbons present nearly altogether, and this relation upon the silicon content and the rate of cooling, a direct breaking of a casting, or the test bar supposed to represent the iron in it, is the best indication of the value of the material for commercial purposes. All our testing methods must therefore be based upon the resistance of a properly prepared, shaped, and sized bar, to a breaking force applied as nearly approximating service conditions as possible.

The sulphur is the next element of importance. The better this is kept down the less evil the results. All specifications for pig iron as well as cast iron should contain a clause limiting the sulphur content. Not only is the sulphide of iron very weakening in a casting, but the effect on the carbon present is very marked, much more so than is the case with silicon, weight for weight. The effect of the two elements silicon and sulphur on the carbon being of an opposite nature in a great measure, the effect of undue quantities of the latter may be somewhat counteracted by increasing the silicon. Taking the three arbitrary divisions of gray iron castings, the light, medium, and heavy, a limit should be placed in the sulphur at .08, .10, .12, respectively.

Of phosphorus and manganese we need only say that they also tend to harden the iron by keeping the carbon in a state of combination. This is only noticeable when the amounts present run much above 1 percent. These elements, however, have other properties which make their presence in quantity a consideration of good foundry practice.

Quality of Pig Iron.

The next point to consider is the quality of the pig irons entering the mixture. A high grade, honest pig iron, when properly melted in the foundry, always makes a better casting than an "off" iron, so called, the composition of each being identical. That is to say, the blast furnace practice has a marked effect on

the ultimate strength of the casting, depending upon whether charcoal or coke fuel was used, and if "mill cinder" found its way into the burden in large quantities. It must not be forgotten that the melting processes of the foundry are not in the nature of refining methods in spite of the fact that silicon as well as manganese is burned out. It is very easy to ruin a good pig iron by remelting, but it cannot be improved if originally bad. The troubles due to bad blast furnace practice are probably due mostly to imperfect reduction of the ore or cinder before the melting zone is reached. At least that seems to be the natural inference. At any rate we have to deal with cold blast charcoal iron, warm blast charcoal iron and coke iron, excellent in the order named. Specifications for castings to be made of charcoal iron can therefore be made much stricter, if desired, than could be asked for the more general coke made product.

Furthermore, there is a distinct difference in the constitution of castings depending upon whether the mixture consisted of all pig iron or had heavy scrap percentages. The latter castings are always the stronger.

The Question of Temperature.

Now comes the important "rate of cooling" in the discussion of the points bearing on the proper testing of cast iron. Here also the carbon content is all important. If a fairly low silicon iron be cast into a section ½ inch thick it will be perfectly white, the carbon remaining all combined. If the very same iron be cast into a section 2 inches thick, it will be altogether gray in fracture. On the other hand an iron cast very hot has a higher percentage of combined carbon than the same material cast colder into the same work. Hence it will be seen that a test bar cast hot is stronger than one cast cold.

It is therefore of extreme importance, in selecting a test bar to determine the quality of the iron under consideration, that a section sufficiently large be adopted to minimize as far as may be the effect of varying casting temperatures, and the chilling due to the mold. It may as well be said right here that a dried sand mold is preferable for this purpose, thus at once eliminating the dampness incident to the green sand procedure. It further stands to reason that the often advocated ½ inch square test bar is perhaps the worst that can be selected, all the results obtained with it being artificially high, and subject moreover to all the varying influences of the mold and the pouring temperature. Again, it is also desirable to take a round section in preference to the square one, thus cutting out the artificial chill on the four corners of the latter.

We must further take into account the commercial factors involved, in determining upon our line of testing. The ideal method is of course to actually break one or more of a given lot of castings. While quite an array of special castings can be and are thus tested, a careful canvass of the situation shows that at present only one line of work can be thus handled with satisfaction, and that is the cast iron car wheel. The variety of specifications for this material are now being codified, and we will soon have a standard specification acceptable as well to the consumer as to the maker.

All the other 35 or more lines of cast iron products must be judged by the quality of the iron in them, and this by means of a test bar. For practical purposes even these classes of castings are limited to light, medium, and heavy jobbing castings, pipe, cylinders, and malleable castings. For these standard specifications are now being gotten up under the auspices of the American Society for Testing Materials, all those who are interested cooperating with this association in an earnest effort to raise the plane of foundry work, and at the same time place cast iron in its proper position among the metals useful to mankind.

Size of Test Bars and Method of Casting.

The selection of the section of the test bar depends upon two things. First, that it should be as large as possible consistent with a uniform structure. Second, it must come within the limits of the ordinary testing machine. A series of test bars ranging from ½ inch to 4 inches square, and of corresponding area round, such as made for the American Foundrymen's Association, has shown that for the gray irons any section above 1½ inches thick begins to show weakness in the structure, while below 1 inch, the grain is unduly close. For the ordinarily white irons, the upper limit has not been found, while the lower is about 1¼ inch. Now as it is desirable to make all transverse tests on supports 12 inches apart as the most sensitive distance for bending pressure, and as 5,000 lb. is the limit of the ordinary testing machines in use in our foundries, a 1¼-inch round bar, 15 inches long

(broken on 12-inch supports) is the natural standard to work with.

The molding of such a bar involves a few interesting points. A bar cast flat is well known to have iron of one strength on the lower side and quite a different quality on the upper. If therefore the bar be broken cope side up, the result will be different from drag side up. Hence it is imperative that test bars shall be cast vertical. The molds should be well dried and cold before casting. It is furthermore advisable to round off the bottom of the pattern, so that as the iron drops through the funnel-shaped gate, it may not shot itself and thus injure the bar. The idea, recently advised in Germany, of bottom pouring the bars, while logical, involves too much trouble for successful application in everyday work. Then also the bars must be so molded that no fins are left on the castings.

The speed of testing, number of bars to be cast, how tested, and what disposition is to be made of the results obtained; all these things present interesting features. I can do no better, therefore, than to present the tentative specifications developed by our general committee on testing cast iron, of the American Society for Testing Materials. All the possible safeguards are here presented so clearly and to the point, that the document forms a distinct advance in our foundry ideals.

[These proposed specifications are printed on another page.]

The subject of testing cast iron has been up time and again before our engineering bodies, notably that of the mechanical engineers. Much work was done at the time, but no definite results came of it. Then the American Foundrymen's Association took up the matter and its committee developed a line of investigation which embodies the experience of practical foundrymen who should be best able to handle the metal with which they are in daily contact. A set of specifications was gotten up, in fact served somewhat as a basis of those above given, but were adopted subject to change by the American Society for Testing Materials. This association serves as a sort of clearing house for the industrial and scientific bodies of the country, the producer, consumer and engineer being represented alike on the various committees. This summer will likely see a definite adoption of specifications for testing cast iron and finished castings. The general committee will remain intact so that at future times changes and improvements can be made as experience may suggest. The American specifications will be presented this summer to the International Congress for Testing Materials to be held in St. Petersburg, and another chapter in the remarkable history of cast iron will have been completed.

To the credit of the foundry industry be it said that practically all the advance in the art is the work of active founders, who gave their time and efforts freely in the interest of the trade, and who moreover did not begrudge the expense this work entailed, even if the benefits were shared by those who gave the least substantial encouragement.

The directions in which future methods of testing would seem to lie, are twofold. For the finished castings ways and means will be found to specialize the tests, actually breaking some of a given lot to represent the whole under service conditions. This line of work is to be welcomed specially. For cast iron itself, more work and method in making impact tests on test bars will be in order, for in this way will we get nearest the actual conditions under which our castings are subsequently used. Our investigators are therefore urged to look into this feature of the testing of cast iron, and will be certain to unearth many valuable and interesting facts connected with the constitution of the material we call our own.

"Something Pneumatic" is the title of a new monthly publication which is to be put out by the Chicago Pneumatic Tool Co. The first copy, that for April, is in our hands and we notice that it contains interesting material concerning the applications of pneumatic machinery, though of course the principal applications are those of the appliances made by the Chicago Pneumatic Tool Co. In their editorial they make the following statement: "'Something Pneumatic' is not an attempt on our part to enter the legitimate trade journal field. It is rather the result of an endeavor to give publicity more widely than is possible through the advertising columns of the trade papers to the numerous advantages resulting from the use of pneumatic appliances and to bring to the attention of our numerous customers such new appliances as we may develop from time to time."

The Alliance, O., plant of the American Steel Foundries, which were shut down indefinitely about two months ago, resumed operation April 1.

A PATTERN RECORD.

BY R. W. MACDOWELL.

The problem of the patterns and pattern room is one which has vexed many foundrymen and patternmakers and probably will for years to come. Patterns continue to accumulate from time to time, especially in a shop that is not confined to one special article or class of articles, and it is a proposition to keep a satisfactory record of them, as well as to have them in such shape that they can be gotten at without a long and wearisome search every time an old pattern is required. This of course refers the care of this department to some one of the employes who has become familiar with the patterns through long association, and who can usually be depended on to get anything required in a reasonable time, by the aid of a good memory and a knowledge of "where he saw it last," and in a great many cases it cannot be denied that this method seems to work very well. It has the disadvantage, however, that the employe in question may not always remain in your service, and that he may be absent at a time when something in his line is very badly needed; not to mention the

PATTERN SHOP ORDER ORDER NO. A 175

KEYSTONE FOUNDRY COMPANY

To J. B. Hill

PLEASE PREPARE FOR Order 579

THE FOLLOWING, TURNING IN ORDER WHEN WORK IS COMPLETED.

DATE. 5/20/03

NUMBER	ARTICLE	PATTERN NUMBER	WEIGHT	MACHINE WORK
1	Spring Seat Wood Pattern, V-1947 Tracing 2047 B. Wanted by 6/5/3	105		

KEYSTONE FOUNDRY COMPANY

PER J. M. C.

REQ. No.		PRICE	
ACC'T	CLASS	COST	

THE PATTERNMAKER

FORM I.

particularly to the general jobbing shops where orders for all classes and kinds of castings are required. In a shop making car castings, for example, there will be many patterns gotten out for one order, which will not be needed for a long time again after the order is completed, although it is certain that they will be required for similar work at a future date. After a few years of this process of making patterns and using them then storing them away, you have an accumulation around the shop that is appalling, and when some special pattern is required it is a long and laborious task to pick it out. The practice in many shops is to leave troubles you have at the time of taking stock, and the hazy ideas you have as to the value of the patterns on hand.

The best plan in our estimation is to have a building devoted to the pattern department; if this is not practicable have at least a good sized room. If you have a pattern shop, let the pattern room adjoin it, as this will be found much more convenient. Provide spaces, shelves, etc., for the different styles of patterns, on each of the four sides of the room, and number the spaces to correspond with the pattern numbers. We think the best way is to simply number from 1 up, although others

105

NAME OF PATTERN	PATTERN NO.
Spring Seat	105
B. S. Co order 579	DRAWING NO. 2047-13

DATE	MATERIAL	NUMBER OF PIECES	COST	WEIGHT OF CASTINGS
5/29/03	Wood		$4.58	40#

REMARKS (CHANGES, ETC.)

7/15/03 Changed to weigh 35#

8/1/03 8 Iron Patterns #105 5.44

Ea. 68¢

LOCATION

ROOM 1 1

RACK C

SHELF 19

SIDE 3 2

Wood Pattern 8 Iron Patterns

THE PATTERNMAKER

PATTERN NO. 105 DATE MADE 6/4/03

USED ON *Order 579

SHOP ORDER NO. A 175

TAKES PLACE OF Old spring seats. Tracing 2047-A

KIND MATERIAL	COST MATERIAL
Wood	1.18
	" LABOR 3.40
ROUGH WEIGHT 40#	
FINISHED WEIGHT	NET COST 4.58

TIME 8½ M H. PER HOUR 40¢ PIECE WORK

LIST PRICE

THE PATTERNMAKER

FORM 2.

might find it better to run them in series, prefixing the letters of the alphabet to each series, as A5, G98, etc. In any case it is well to give additional numbers to the shelves, in order to locate a pattern with more ease. A separate room should also be provided for patterns which are not likely to be used again, and a notation should be made in your pattern record whenever a pattern is transferred from the regular pattern room to the "graveyard."

When a pattern is to be made, a shop order should be made out, and the blue print or drawing should accompany the order to the pattern shop. All time and material spent on this order should be accounted for, being of course charged up against the cost of the pat-

tern. A form of this order is illustrated in Form 1. In making the pattern care is observed to get the number shown on the order in a place where it can easily be found, using the ordinary pattern letters for the purpose.

As soon as a pattern is completed and the order turned in to the office, a record should be made out. This may be in book form, a card, or a loose sheet. We illustrate the card form, as we think it the most convenient, but a loose sheet, or book page could be arranged in a similar manner. Both sides of the card are used. On the face is given the name of the pattern, the number, weight of castings from the pattern, and a space for remarks. On the reverse side we have the number, date, and information pertaining to the cost of the pattern. If there is more than one pattern on an order, the cost of one is noted on the reverse side, while the total cost is noted on the face, for convenience in listing. In the form shown, (Form 2), there is a notation of 8 iron patterns made at a later date, but this is not really necessary, as when later patterns are made bearing the same number as the original, there should be a card made out in the same way and filed behind the original card. These latter cards should not bear tabs, as the original card will serve as an index. Either method may be used, however. Some concerns may wish to keep the record of all duplicate patterns, bearing the same number, on one card, while others prefer a separate card for every order issued. Personally, we think the latter method the best.

In regard to the location of the patterns, a good plan to adopt is to keep them as nearly as possible in numerical order. We say "as nearly as possible," for the reason that there may be some few patterns made which would be too large to go in the space which would ordinarily bear their number, so that they would have to be put somewhere else. This is not common with patterns like those where this system has been in use. Of course, conditions vary so in different shops that it would be impossible to lay down a fixed rule for the numbering and arranging of patterns; some might find the above plan just suited to their needs, while others would find it impracticable. But in most cases the general outline of this will be found satisfactory and the cards can easily be modified to suit the arrangement of the patterns themselves.

For the use of anyone who does not like a card record, or who wishes to keep his pattern record in book form, a loose sheet record is illustrated. (Form 3). This will often be found very convenient where there are not many patterns, or where it is desirable to run them in series. In the latter case a sheet can be made out for each series, each sheet bearing the series letter that is used for each particular class of pattern. The sheet illustrated shows the "D" series, and provides spaces for the pattern number, name, and material, the date it was made and the order number, the location, remarks and the cost. This latter item is obtained from the shop orders, the same as on the cards, and two columns are provided, one for the cost of each pattern and one for the total value of the patterns of that series. When a pattern is disposed of in any way, the value of each column is crossed out and the totals, which are carried in lead pencil, are changed. This makes it a very simple matter to keep track of the value of the patterns on hand at all times, and is convenient at stock taking and such times. The accurate index given for the location of patterns, makes it a very easy matter for anyone to go and pick out a pattern without having to depend on any person's special knowledge of its location, and to replace such patterns when through with them. Of course it must be understood throughout the shop that as soon as the order is completed the patterns used on it must be returned to their proper places, and it is a good plan to

SERIES D
SHEET 1

PATTERN RECORD

NUMBER	NAME	MATERIAL	MADE		LOCATION				REMARKS	COST	
			DATE	ORDER NUMBER	SIDE	SPACE	SHELF	DIVISION		EACH	TOTAL
D. 1	Separator 5×8	Wood	9/18/02	0. 16	1	1	4	D	Scrapped 5/23/03		
" 2	" 5×9	"	9/11/02	" 21	1	1	4	D		68	68
" 3	" 5×9	"	"	" "	1	1	4	D		68	68
" 4	6 " 2×6	"	9/19/02	" 23	1	2	4	D	B. L. Co 519	30	1 80
" 5	4 Center Bearings	Iron	11/18/02	" 69	1	5	7	D		45	1 80
" 6	5 "	"	11/18/02	" 72	1	6	8	D	Jr. 678 D	120	6 00
" 7	End Rest	Wood	12/4/02	" 86	1	3	5	D		4 18	4 18
" 8	5 " "	"	12/24/02	" 118	1	3	5	D		4 25	21 25

THE PATTERNMAKER

FORM 3.

have some one person kept in charge of the pattern room if the number of patterns is sufficient to warrant it, or if there are not many patterns, to have the foreman and no one else get patterns, when needed and return them when through with them.

The last form given can also be adapted to the numerical system of arranging patterns if so desired, by simply starting at No. 1 on the first sheet, and filling in additional sheets as needed. The form of the sheet would not have to be changed, and the location could be noted in the proper columns according to the arrangement of the patterns. Both of the arrangements have their advantages, and can be worked readily with either the sheets or cards. By running the patterns on the sheets, in series, it is much easier to determine the value of the patterns on hand, besides being a very compact record, while the use of the card allows a varied style of indexing, it being practicable to index by numbers, series or alphabetically, or in combinations of two of these methods. The card also provides a more complete record of the cost, etc., of each pattern, and would be preferred by many on this account.

Either system, however, is far better than letting patterns accumulate with no other record than is gotten at the yearly stocktaking, and we think could be adopted with modifications in many shops. Records of this kind can be kept with little trouble, and the advantages derived therefrom more than balance the slight clerical labor required for their maintenance.

PROPOSED SPECIFICATIONS FOR CASTINGS.

Members of the committee for Testing Cast Iron and Finished Castings, of the American Society for Testing Materials, have received recently copies of the standard specifications proposed by various sub-committees. Among the specifications thus sent out for the approval of the general committee, are those of the sub-committees on malleable castings and the sub-committee on general castings. These are reproduced below. Stanley G. Flagg, of Philadelphia, is chairman of the sub-committee on malleable castings and Thos. D. West, of Sharpsville, Pa., of the sub-committee on general castings:

Proposed Specifications for Malleable Castings.

PROCESS OF MANUFACTURE.

Malleable iron castings may be made by the open-hearth, air furnace or cupola process. Cupola iron, however, is not recommended for heavy nor for important castings.

CHEMICAL PROPERTIES.

Castings for which physical requirements are specified shall not contain over .06 sulphur nor over .225 phosphorus.

PHYSICAL PROPERTIES.

(1) *Standard Test Bar.* This bar shall be 1 inch square and 14 inches long, without chills and with ends left perfectly free in the mold. Three shall be cast in one mold, heavy risers insuring sound bars. Where the full heat goes into castings which are subject to specification, one mold shall be poured two minutes after tapping into the first ladle, and another mold from the last iron of the heat. Molds shall be suitably stamped to insure identification of the bars, the bars being annealed with the castings. Where only a partial heat is required for the work in hand, one mold should be cast from the first ladle used and another after the required iron has been tapped.

(2) Of the three test bars from the two molds required for each heat, one shall be tested for tensile strength and elongation, the other for transverse strength and deflection. The other remaining bar is reserved for either the transverse or tensile test, in case of the failure of the two other bars to come up to requirements. The halves of the bars broken transversely may also be used for tensile strength.

(3) Failure to reach the required limit for the tensile strength with elongation, as also the transverse strength with deflection, on the part of at least one test rejects the castings from that heat.

(4) *Tensile Test.* The tensile strength of a standard test bar for castings under specification shall not be less than 42,000 pounds per square inch. The elongation measured in 2 inches shall not be less than 2½ percent.

(5) *Transverse Test.* The transverse strength of a standard test bar, on supports 12 inches apart, pressure being applied at center, shall not be less than 3,000 pounds, deflection being at least ½ of an inch.

TEST LUGS.

Castings of special design or of special importance may be provided with suitable test lugs at the option of the inspector. At least one of these lugs shall be left on the casting for his inspection upon his request therefor.

ANNEALING.

(1) Malleable castings shall neither be

"over" nor "under" annealed. They must have received their full heat in the oven at least sixty hours after reaching that temperature.

(2) The "saggers" shall not be dumped until the contents shall at least be "black hot."

FINISH.

Castings shall be true to pattern, free from blemishes, scale or shrinkage cracks. A variation of 1-16 of an inch per foot shall be permissible. Founders shall not be held responsible for defects due to irregular cross sections and unevenly distributed metal.

INSPECTION.

The inspector representing the purchaser shall have all reasonable facilities given him by the founder to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made prior to shipment.

Proposed Specifications for Gray Iron Castings.

PROCESS OF MANUFACTURE.

Unless furnace iron is specified, all gray castings are understood to be made by the cupola process.

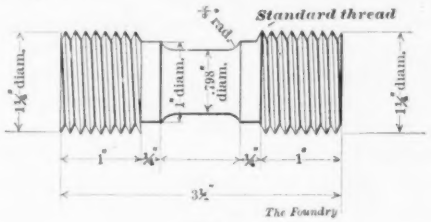


FIG. 1.

CHEMICAL PROPERTIES.

The sulphur contents to be as follows:

Light castings .....not over 0.08 percent
Medium castings .....not over 0.10 percent
Heavy castings .....not over 0.12 percent

DEFINITION.

In dividing castings into light, medium and heavy classes, the following standards have been adopted.

Castings having any section less than ½ of an inch thick shall be know as *light castings.*

Castings in which no section is less than 2 inches thick shall be known as *heavy castings.*

Medium castings are those not included in the above definitions.

PHYSICAL PROPERTIES.

Transverse Test. The minimum breaking strength of the "arbitration bar" under transverse load shall be not under:

Light castings .....2,500 lb.
Medium castings .....2,900 lb.
Heavy castings .....3,300 lb.

In no case shall the deflection be under .10 of an inch.

Tensile Test. Where specified, this shall not run less than:

Light castings.....18,000 lb. per sq. in.
Medium castings.....21,000 lb. per sq. in.
Heavy castings.....24,000 lb. per sq. in.

THE "ARBITRATION BAR" AND METHODS OF TESTING.

The quality of the iron going into castings under specification shall be determined by means of the "Arbitration Bar." This is a bar 1¼ inches in diameter and 15 inches long. It shall be prepared as stated further on and tested transversely. The tensile test is not recommended, but in case it is called for, the bar as shown in Fig. 1, and turned up from any of the broken pieces of the transverse test shall be used. The expense of the tensile test shall fall on the purchaser.

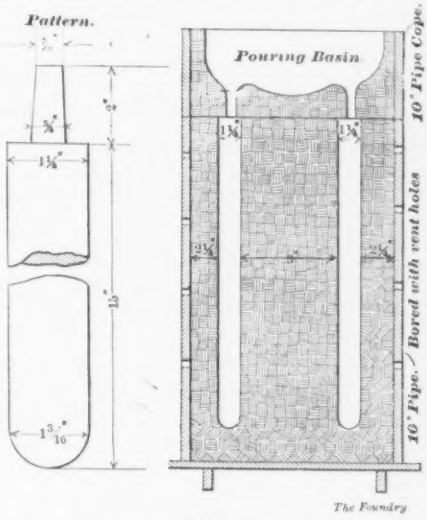


FIG. 2.

Two sets of two bars shall be cast from each heat, one set from the first and the other set from the last iron going into the castings. Where the heat exceeds twenty tons, an additional set of two bars shall be cast for each twenty tons or fraction thereof above this amount. In case of a change of mixture during the heat, one set of two bars shall also be cast for every mixture other than the regular one. Each set of two bars is to go into a single mold. The bars shall not be rumbled or otherwise treated, being simply brushed off before testing.

The transverse test shall be made on all the

bars cast, with supports 12 inches apart, load applied at the middle, and the deflection at rupture noted. One bar of every two of each set made must fulfill the requirements to permit acceptance of the castings represented.

The mold for the bars is shown in Fig. 2. The bottom of the bar is 1-16 of an inch smaller in diameter than the top, to allow for draft and for the strain of pouring. The pattern shall not be rapped before withdrawing. The flask is to be rammed up with green molding sand, a little damper than usual, well mixed and put through a No. 8 sieve, with a mixture of one to twelve bituminous facing. The mold shall be rammed evenly and fairly hard, thoroughly dried and not cast until it is cold. The test bar shall not be removed from the mold until cold enough to be handled.

SPEED OF TESTING.

The rate of application of the load shall be thirty seconds for a deflection of .10 of an inch.

SAMPLES FOR CHEMICAL ANALYSIS.

Borings from the broken pieces of the "arbitration bar" shall be used for the sulphur determinations. One determination of each mold made shall be required. In case of dispute, the standards of the American Foundrymen's Association shall be used for comparison.

FINISH.

Castings shall be true to pattern, free from cracks, flaws and excessive shrinkage. In other respects they shall conform to whatever points may be specially agreed upon.

INSPECTION.

The inspector shall have reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall, as far as possible, be made at the place of manufacture prior to shipment.

REVIEWS.

A New Method of Casting Bronze.

Eisen-Zeitung, March 10: George Lieusson, of Paris, has invented a method of casting bronze which allows of a most perfect reproduction of the metal mold employed. The difficulty usually experienced with a metal mold in this class of work, is that the bronze adheres to it, and is apt to tear away from the casting on forcible removal. The invention consists in adding metallic sodium to the tin of the alloy, in proportion of about 1½ parts sodium to 100 parts bronze. The sodium being oxidized away during the process the 100 parts of bronze remain. The method is as follows: The sodium and the tin are heated in separate crucibles, the former up to 175 to 200 degrees F., the latter up to 400 to 435 degrees F. When the tin has reached this point, the heated sodium is added, all this being done with the air excluded as much as possible. The tin must on no account be hotter than the upper limit given, otherwise the sodium will ignite. The alloy of tin and sodium thus made, upon cooling, can be broken up into pieces and is then added to the copper for the bronze. It may also be saved for future use. When the bronze is to be made, the copper is heated up to 1,300 to 1,400 degrees F., which is below its melting point, and the alloy of sodium and tin added in the right proportion. This is done for the reason that were the copper melted, the sodium would at once volatilize, and its value for de-oxidation purposes lost. As soon as the alloy is added to the copper at say 1,350 degrees F., the alloy melts, and the sodium in it begins to absorb oxygen with a corresponding development of heat. The copper melts, and as soon as the fusion is complete, the metal is poured into the metal molds. While the metal is being poured the remaining sodium goes off in fumes which form a layer between the mold and the metal, thus allowing the casting to be taken out without any difficulty afterwards. The casting is so perfect that no hand work is necessary, and the coating due to the oxidized material is readily removed by immersion in dilute hydrochloric acid.

Small Open-Hearth Furnaces for Steel Castings.

Stahl und Eisen, March 15. An interesting article on the use of small open hearth furnaces for making gray, malleable and steel castings in place of the regular methods for the production of these castings on a large scale, is given in this journal. Furnaces to melt about one ton and a half for a charge are so built that but half a ton is treated to begin with, subsequent enlargement of the business being thus provided for. Similarly other furnaces to melt four tons are arranged to take but one ton in the beginning. It is claimed that with six heats of steel in twenty-four hours that the melting ratio for these small quantities is as good as 1 to 3.

Internal Economy of the Brass Foundry.

The Ironmonger, Feb. 27. Prof. Thomas Turner, of the Birmingham University, recently lectured on the above subject, stating that the large engineering firms of England are now erecting their own brass foundries, rather than buying their brass castings as heretofore. Light, well ventilated buildings are erected for this purpose, with facilities for storage of supplies, sidings, and often connection by water. In regard to the sickness which brass molders were liable to, there are two forms—an acute brass poisoning, due to the fumes of copper and zinc, which gives the men tremors, and which only the copious use of milk will mitigate; the second malady is accompanied with pulmonary troubles, and affects women more than men in a shop. Ventilation, light and the removal of the fumes by exhaust are the remedies suggested. The provision of adequate lavatory accommodations are the most important of the improvements that can be made to protect the health of the molders. The elimination of the fumes over the crucible is best effected by the "Lynes" fume-extractor, and consists of a simple hood with pipe attached going out to the atmosphere. This leaves the interior of the building clear and free from the fine particles of zinc oxide, otherwise floating about.

Prof. Turner then described the mixing of the metal and the methods of melting it, the grinding of the sand, molding, shaking out, and the subsequent treatment of the castings before leaving the foundry, all of which is well known to our brass founders.

ASSOCIATIONS AND SOCIETIES.

The Philadelphia Foundrymen's Association.

HOWARD EVANS, SECRETARY, CARE J. W. PAXSON CO.

The regular meeting of the Foundrymen's Association was held at the Manufacturers' Club in Philadelphia, on Wednesday, April 6, the president, Thomas Devlin, occupying the chair.

The treasurer reported a balance in the treasury of $2,150 and all bills paid. At the invitation of the chair E. E. Brown, the association's representative on the committee having executive project of the St. Louis Exposition foundry exhibit, detailed the work done by the committee so far, and stated that a member of the committee was now in St. Louis to confer with the exposition authorities. On his return to New York the committee would have another meeting and make a final decision, which would be made public, whether the proposed exhibit would be made or not. One thing was certain, he said; the committee would not undertake the carrying out of the plans formed unless the exhibit could be made entirely creditable to the foundry trade generally.

A communication was read from the secretary of the Philadelphia committee, having in charge the entertainment of the members of the Iron and Steel Institute when they visit Philadelphia next fall, asking the support of the association. The communication was ordered to be filed.

Another communication was read from Dr. Moldenke, secretary of the American Foundrymen's Association, inviting local foundrymen to attend the convention of that association to be held in Indianapolis June 7, 8 and 9 and in St. Louis June 10.

The lecturer of the evening was Prof. Wm. Campbell, of Columbia University, New York, his subject being "The Microscopical Examination of Alloys." The lecture, which was profoundly interesting, was illustrated by 50 lantern slides.

There was little or no discussion on the subject at the conclusion of the lecture. Asked whether the conditions he had illustrated by means of plotted curves represented definite relations of the constituents, Prof. Campbell said: "They always have the same position. The best example, perhaps, is to be found in common solder, 2 parts tin and 1 part lead. If you take these metals half and half you have an excess of lead, and as that cools down you get crystals of lead. The part of the mother liquors is to crystallize out. You can see the reason why a plumber can take a good solder, 2 to 1, and wipe a joint clear and white, but if he takes a half and half alloy it is apt to produce a dirty white."

Mr. Davis requested that Prof. Campbell favor the meeting with a little history of the work in metallography which he had demonstrated and present an idea of the vast amount represented in the research described. The process employed, Mr. Davis said, was somewhat expensive and was calculated to make an ordinary chemical look very small. The slides shown, he added, represented only an infinitesimal part of an inch in surface of metal.

Prof. Campbell, in reply, said that chemistry

would determine what metals an alloy was composed of, and metallography would show how they exist. Metallography, he said, was a most interesting study, and within the scope of almost anyone. The action of an alloy in heating and cooling was highly important as bearing upon the resulting structure, and in consequence metallography as a study was being widely taken up. A most valuable auxiliary to the study was the microscope, and this, with a desire to make research, was mainly all that was required. He mentioned many cases of men in different parts of the world who, with very little knowledge of chemistry, had made some useful discoveries of the property of metals through metallography. Concluding he gave a brief history of the new science of metallography and the connection of many eminent scientists with researches on record.

A vote of thanks was presented to the professor for his presentation of the subject.

The question of closer relations with sister associations was then taken up, and considerable discussion evolved. Finally, on motion of Dr. Brown, it was resolved to suspend the order of business at the next meeting and hold a dinner, to which invitations would be extended to the New England and Pittsburg associations.

New England Foundrymen's Association.

FRED F. STOCKWELL, SECRETARY, CARE OF BARBOR-STOCKWELL CO., CAMBRIDGEPORT, MASS.

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, Wednesday, April 13. B. M. Shaw, president, was in the chair. Henry Souther, of the Henry Souther Engineering Co., Hartford, Conn., gave a very interesting address on "Specifications for Cast Iron," along the lines suggested by the committee on testing cast iron and finished castings, appointed by the American Society for Testing Materials. Mr. Souther discussed the standard specifications for gray iron castings as proposed by the above committee. These are published in another part of this number. These provided a sulphur limit of .08 percent for light castings, .10 for medium castings and .12 for heavy castings. Light castings were defined as those having any section less than ½ inch thick, and heavy castings as those in which no section is less than 2 inches thick. The quality of iron going into castings under specification is to be determined by means of an "arbitration bar," this bar to be 1¼ inches diameter and 15 inches long and cast on end. The breaking strength of this bar under transverse load is required to be 2,500 pounds for light castings, 2,900 pounds for medium castings, and 3,300 pounds for heavy castings. The speaker said that the round test bar was more reliable than a square one and by casting on end uniform structure was secured from top to bottom.

At the conclusion of Mr. Souther's address dinner was announced, after which business was disposed of in the usual manner.

A report was received from the committee on resolutions upon the deaths of Lorrine E. Stannard and S. K. Lovewell. The resolutions were accepted and a page in the records set aside for them.

Notice from the American Foundrymen's Association was read announcing that the annual convention would be held at Indianapolis on June 7, 8 and 9, and at St. Louis on June 10. On motion the chair appointed Messrs. John Magee, Fred F. Stockwell and Harry Gibby as a committee to look up the matter of transportation and other information.

Vice President Magee then presented the following memorial to the American Foundrymen's Association, and on motion the chair appointed John Magee, Arthur Gibby and Joseph Anthony as a committee to represent the New England Foundrymen's Association in the matter:

WHEREAS, we, the New England Foundrymen's Association, have recently had presented before us by Mr. Thos. D. West, a most original and instructive paper embodying new thought in regard to testing the hardness of packed bodies of sand constituting a mold for casting hard metals, and

WHEREAS, we have been shown in connection with said paper a novel device whereby the degree of hardness of said sand may be reliably measured, and

WHEREAS, it is at the present time impossible to obtain any exact information on this subject, except such comparative information, in many cases of rather doubtful value, as may be personally conveyed, therefore be it

Resolved, that we, the members of the New England Foundrymen's Association, through our undersigned committee, do hereby petition the American Foundrymen's Association to establish a committee of five members, or such number as shall seem best to its chair-

man, for the purpose of investigating, measuring and classifying the hardness of molds, to establish proper standards of measurement for same, and to list such classes of work as shall seem to them desirable, showing the most suitable degree of hardness for the body of the mold in each class of work.

A communication from the Philadelphia Foundrymen's Association inviting the New England Foundrymen's Association to attend a meeting to be held in conjunction with the Pittsburg and Philadelphia associations at Philadelphia on May 4 was read and on motion the secretary, Fred F. Stockwell, was elected to represent the association, and he was instructed to send a circular notice to the members of this association relative to this invitation.

A letter was read from H. A. Carpenter relative to meeting held in New York by the committee on St. Louis Foundry Exhibit building, which detailed the work done by the committee so far.

A. E. McClintock, secretary of the National Founders' Association, made a few remarks pertaining to the national conference held April 7 at Detroit by a joint committee representing the National Founders' Association and the Iron Molders' Union of North America. The effort to secure a national agreement on some questions which have been at issue between the two organizations was unsuccessful.

President Shaw presented the following subjects, important in foundry practice, for general discussion, and the interchange of views made the evening very interesting. We report the answers given, but omit the names of the participants in the discussion:

1. "How do you figure the cost of iron in the ladle?"

Ans. This question was replied to very briefly, the speaker producing a few rough specimens showing how the matter was handled at his foundry, figuring the average cost at ruling market prices.

Ques. "What disposition is made of the casting sprues?"

Ans. The sprues are charged back to the furnaces the same as scrap iron.

2. "What is your highest percentage of good castings obtained?"

Ans. We run a strictly jobbing shop and have not followed this matter up at all. I would say that I do not think it would be beneficial to a foundry of our circumstances to do it. I think it is all right for a specialty shop to follow it, but where they have different jobs coming in it is hard to do it.

Ans. The profits in the stove business are so small that we have to follow the loss very carefully.

3. "What is your experience with anthracite coal in cupola practice?"

Ans. Our foundrymen when we first began to use coke stated that we could not get good castings with coke. We bought various carloads of coke and did not get the proper results. We were driven back to anthracite coal. Some of the foundrymen argued that they could not get their iron hot enough. I guess some foundrymen maintain at the present day that the iron from coke will not hold the heat as long as iron from anthracite coal. The greatest complaint we have had from trying to use coke in the beginning was that we could not get the iron hot enough. I really think from observation of the results that there is a little something in it and that iron does not carry the heat so well as it does with anthracite coal. After becoming educated to the use of coke we certainly would not use anthracite coal. We get better castings from the use of coke than we did from anthracite coal.

Ans. Referring to the previous speaker's remarks, I would state that we had the same trouble when we were using anthracite coal and changed over to coke, and we had to have our furnace reconstructed before we could use coke successfully.

Ans. It is a case of one man on one side of the street making his goods from anthracite coal and a man on the other side using coke. You can do one or the other; the question is, which is the cheaper? If anthracite coal was cheaper, I would advise using it, but I think the first speaker's position is explainable. I do not believe it makes a great deal of difference; it comes down to the common sense basis.

4. "When using iron which has been bought on analysis, specifying that the iron should run between certain fixed limits in carbon, silicon, phosphorus, manganese and sulphur, have you found the results the same, no matter what part of the country the iron comes from, provided it is melted under the same conditions and comes within the specifications; that is, whether it comes from Alabama, Tennessee, Virginia, Pennsylvania, or any other locality?"

Ans. I believe the physical properties are changed by locality. If the physical properties are considered and the chemical analysis, you will get just as good results. The irons I am using today come from different localities than those used six months ago. A few years ago foundrymen would not buy Southern iron. It is simply because they have not the physical properties of that iron. They have paid all their attention to the analysis. I might bring quite a number of illustrations on the subject and I think a great many iron men will agree with me that where they sell iron to foundries that do not have chemists and do not have analysis made of their iron, they recommend only irons that the founder knows from experience.

Ans. I believe what the previous speaker has said. I believe thoroughly in chemical analysis. The main object in specifying iron or buying iron by analysis is to insure regularity. If you specify between certain limits you will get the same results from that iron in my opinion. I believe you must become acquainted with the iron you are using before you can properly specify what the properties of the iron are.

The meeting adjourned at 9:45 p. m.

Pittsburg Foundrymen's Association.

F. H. ZIMMERS, SECRETARY, CARE UNION FOUNDRY & MACHINE CO.

The members of the Pittsburg Foundrymen's Association visited the blast furnace plant of the Clinton Iron & Steel Co., on the South Side, Pittsburg, on Monday night, April 4. No regular meeting of the association was held. The party was taken to the furnace plant from the meeting rooms in a special car and the visit was timed so that the tapping of the furnace could be witnessed. The plant is one of the most complete in the country, being equipped with all the modern appliances known to blast furnace practice. The product consists largely of foundry iron and the iron is sand cast. The slag is all run into a pit where it is granulated and then loaded into cars by means of a clam shell bucket. Duplicates of all the machines required for operating the furnace are provided so that there will be no delay in operations from breakdowns or repairs, etc. The chemical laboratory interested many of the visitors, being complete in its equipment. All of the material entering the furnace is analyzed, while tests are made of every cast and all of the iron is inspected. After the tour of inspection the party was served an elaborate lunch in the company offices.

New York Foundry Foremen.

F. C. EVERITT, CARE J. L. MOTT IRON WORKS, TRENTON, N. J., SECRETARY.

The New York branch of the A. F. F., held their third monthly meeting Saturday night, March 26, at Hotel Montgomery, 90 Montgomery street, Jersey City, N. J.

A very substantial collation was served, after which the meeting was called to order by President Charles H. Thomas, of Newark, N. J. After transacting the necessary business the following papers were read and opened for discussion:

"Metallurgy of Cast Iron," by Mr. A. M. Loudon. Mr. Loudon treated first of the iron in a pure state, its rareness and the impracticability of the metal in this condition. Second, the various elements were taken up and carefully studied. Mixtures valuable for various classes of work were also treated. Mr. Loudon suggested that we take up the elements of cast iron and study them individually, one element for each meeting. The suggestion met with very great approval.

"Experimenting with Samples," by Mr. W. S. Sutherland, of the J. L. Mott Iron Works. The subject was indeed interesting, showing how little attention is given to advertising samples, the use of which might bring to light a material less expensive and as serviceable as those in use. A number of examples were mentioned, which proved very successful financially.

President Thomas read an unusually interesting paper which was for the interest of the foremen in general treating of the many daily occurrences in the foundry, the manner of treating the men, some methods of conducting the foundry, the handling of work and many points of interest in connection with association matters.

All papers were received with very much enthusiasm, and great interest was shown on the part of each member.

Chicago Foundry Foremen's Association.

GEO. C. NIELSEN, SECRETARY, 321 51ST COURT, CHICAGO, ILL.

The regular monthly meeting of the Association was held March 18th. After transacting necessary business, Mr. Geo. C. Nielsen read a paper on the molding machine,

which we publish in another part of this issue. There was quite an animated discussion over the paper, in which many took part. Three new members were taken in. In was also decided to hold a dinner at the next meeting, which will be on April 16th.

THE ASSOCIATED FOUNDRY FOREMEN.

Joseph A. Murphy, Secretary, 114 West Twentieth Street, Erie, Pa.

ERIE FOUNDRY FOREMEN.

Harry E. Kies, Secretary, care of Erie Malleable Iron Co., Erie, Pa.

MILWAUKEE FOUNDRY FOREMEN.

Thomas Glasscock, Secretary, care of Pawling & Harnischfeger Co., Milwaukee, Wis.

INDIANAPOLIS FOUNDRY FOREMEN.

John Reynolds, Secretary, care of Enterprise Foundry & Fence Co., Indianapolis, Ind.

THE ELECTRICAL AGE.

This paper was established in 1883, but it has recently passed into the hands of Mr. Lewis Cassier, whose magazine has been well known for a long period, and noted for its high character and excellent typographical work. The first number of the *Electrical Age* under the new management appeared in February. The February and March issues contain 84 pages of reading matter each, the pages being 9½ x 12½ inches. It is printed on heavy coated paper upon which all the cuts, and especially the halftones, show up very well indeed. Each number contains a large insert, that in the February number being a view of the interior of the power house No. 1 of the Niagara Falls Power Co. That in the March issue is a picture of Thos. A. Edison and his staff at the Orange laboratory. In one of the articles in the March number describing the incandescent light and its history, considerable interesting matter is introduced concerning Thos. Edison. There is a photograph of him at four years old and another at fourteen, also a picture of his birth place at Milan, O.

Many topics of especial interest at the present time are treated in both these numbers of the paper, covering such points as the Cooper-Hewitt mercury vapor lamp, and some of the new developments and applications of electricity in larger power stations. On this subject there are several articles in each number, showing illustrations and giving descriptions of central stations, electric power transmission plants, etc. There is an extremely interesting article in the February number of the electrolytic decomposition of metals under ground. There are articles bearing upon wireless telegraphy in its different forms.

The sections devoted to electrical and mechanical progress, personals, and general notes and news, also to a review of the technical press, are very well arranged and illustrated.

We do not see how any one who is interested in the subject of electricity can afford to be without this paper.

THE D.-C. BOOK CLUB.

The Derry-Collard Co., of 256 Broadway, New York City, have introduced another novel method of selling books, which should be a great advantage to many interested in engineering. They are the first book house in the world, so far as we know, who have offered to send books on approval, the same to be paid for if found satisfactory, and if not, to be returned. This plan gives to those who can not visit a book store selling technical books the privilege of examining and selecting those which would be best suited to their needs.

The new plan is an improvement on the old one, though it retains all the good features of the old. They mail an agreement to any one interested, which is to be filled out and returned to them. The purchaser agrees to pay a certain amount per month in regular monthly instalments. He is then allowed to select the full value of his payments in books, and can order books equal to three months' payments in advance. Mechanical books costing a dollar or more will be sent on approval if desired, with the understanding that if they are not returned in five days they are to be retained and paid for. The agreement can be terminated at any time by paying for the books already ordered, and any balance in favor of the member will be returned to him, but all members who remain in the club for 12 months receive the 12th month free. For instance, a person joining the club and agreeing to pay $3.00 per month, could select $12.00 worth of books at the time he sent in his first payment. If he continued to pay $3.00 each month, he could select altogether $36.00 worth of books during the year, but he would only have to pay $33.00 for them, on account of the fact that he would receive his last month free.

Members are allowed to select books pub-

lished by any publisher, the only limitation being that the return privilege is only given in the case of mechanical books costing one dollar or more each. This book club should certainly open the way for many ambitious men to acquire a good library along particular branches of engineering or shop work which they are following.

PERSONALS.

Warren Presbrey, of Rock Falls, Ill., has resigned his position as molder of pump cylinders at the Johnson & Burleigh foundry. He has worked for 31 years as a molder for this concern and now plans to retire from active work and spend his remaining days with his family. He has always been considered one of the most successful and trustworthy men in the employ of the company.

Robert Gray has resigned his position as shipping clerk with the Los Angeles Iron & Steel Co. and has accepted a similar position with the Martin Foundry & Pipe Co., of San Francisco, Cal.

Mr. M. B. Blair has resigned his position as manager of the Parkersburg Casting Co., Parkersburg, W. Va., and engaged in the foundry business for himself in New Martinsville.

Mr. Geo. H. Wadsworth, patentee of the Wadsworth & Sherwin core machine, has severed his connection with the Railway Speed Recorder Co., Kent, O., and has associated himself with the Falls Rivet & Machine Co., of Cuyahoga Falls, O. He is manufacturing the Wadsworth Improved Core Machine.

Mr. William H. Fisher, of Utica, N. Y., who has been for 11 years foreman of the Utica Pipe Foundry Co., has resigned his position to engage in the foundry business for himself. He expects to establish a foundry at once to do a general foundry business.

Mr. Paul R. Ramp has left his position in Chicago and accepted a position as foreman of the foundry of the Wheeler Condenser & Engineering Co., at Carteret, N. J.

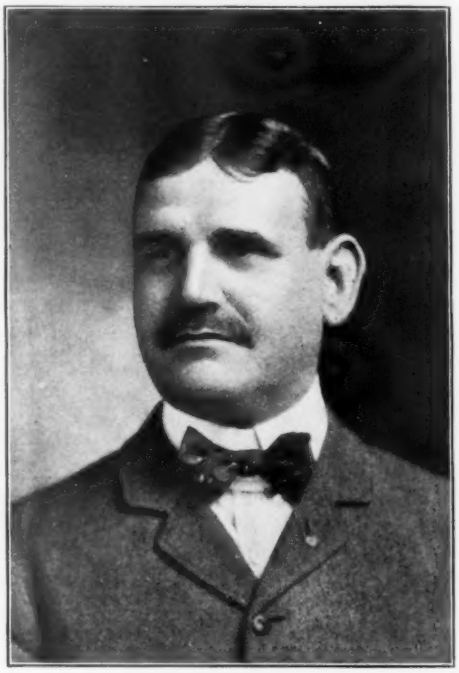
DEATHS.

Joseph Meyrick, of Louisville, Ky., died on April 4th at the age of 77 years. He was a patternmaker by trade and for twenty-five years preceding his death was foreman at the plant of Ainslee, Cochran & Co.

John C. Lamb died Wednesday, March 16th, at his home in Springfield, Ill., at the age of 79 years. Mr. Lamb was one of the earliest residents of Springfield, and for a number of years a member of the firm of Lowry, Lamb & Co., who carried on a general iron foundry business and manufactured plows. In 1891 he retired from active business. He was also interested in many enterprises in Springfield.

Mr. William B. North, of New Haven, Conn., died April 7. He was 59 years old and a member of the firm of O. B. North & Co., iron founders.

James Gifford died April 9, in the house in which he was born, at Hudson, N. Y., aged 75 years. In 1856 Mr. Gifford became a member of the foundry firm of E. Gifford & Sons, of Hudson. In 1863 the firm name was changed to Gifford Bros., as it has since remained.



JAMES D. SMITH.

James D. Smith, secretary and treasurer of the J. D. Smith Foundry Supply Co., Cleveland, died April 20, at his home in that city. Mr. Smith was born Sept. 5, 1858, in Cincinnati. Four months before he was 21 years of age he started in business with the Fitzmorris & Smith Foundry Facings & Supply Co., of Cincinnati. A few years later the company was reorganized as the J. D. Smith Foundry Facings & Supply Co. In December, 1899, Mr. Smith consolidated his business with that of S. H. Chamberlain, proprietor of the Cleve-

land Facing Mill, and moved with his family to Cleveland. The business has been very prosperous and Mr. Smith was widely and favorably known among foundrymen throughout the United States. The company manufactures all kinds of foundry facings and blackings, supplies for iron and brass foundries and patternmakers, and imports plumbago, silver and black lead. Mr. Smith leaves a widow, three sons, two of whom were in business with him, and a married daughter.

FIRES.

Fire in the St. Louis plant of the American Radiator Co., April 8, caused a loss of $4,000.

Faunt Bros. Brass Foundry in Chicago, Ill., was damaged by fire to the extent of $10,000 on April 13th.

The iron foundry of P. J. Clark & Co., of Tifton, Ga., was destroyed by fire on April 12. The loss is $4,000, on which there is no insurance.

The prompt action of the assistant superintendent and the night force of workmen at the United States Heater Co.'s plant in Detroit, Mich., checked what might have been a serious fire on the night of April 8th. As it was, the core building, 30 x 100 feet, was destroyed, together with a number of patterns and other valuable material. The loss is estimated at $5,000, fully covered by insurance.

The large stove foundry of the Wehrle Co., Newark, N. J., was visited by fire April 7. The destruction of the entire plant was threatened but the flames were confined to the office, mounting room and steel shop, where $40,000 worth of steel was destroyed. Total loss was about $100,000, covered by insurance. Three hundred men went to work the morning after the fire clearing away the debris.

The B. F. Clarke Foundry, Rumford Falls, Me., was destroyed by fire recently. Loss $2,000, insurance $1,200.

The main foundry building of the Tacony Iron Works, Philadelphia, was destroyed by fire March 23, causing a loss of $50,000. Many valuable patterns were destroyed.

The machine shops of the Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa., were destroyed by fire recently, entailing a loss which will probably reach $200,000.

For the fourth time in four months there was a fire, March 27, at the plant of the Highland Foundry, Roxbury, Mass. As in the previous fires, the origin is a mystery, but it is believed to be incendiary. The fire was confined to a 3-story brick building occupied as a store room. The damage is estimated at $2,000, fully covered by insurance.

NEW CONSTRUCTION.

The Elm City Brass & Rivet Co., of Hartford, Conn., have constructed an addition 60 x 140 feet to the old Clark & Cowles shop and have moved the old store house and turned it into a foundry.

The North & Judd Mfg. Co., of New Britain, Conn., is making extensive improvements on its plant. The old annealing building is being converted into an iron foundry and other improvements being carried forward.

The Martin Hardsocg Mfg. Co., of Allegheny, Pa., are planning to rebuild their foundry which was destroyed by fire early in the winter. The plans have been completed and it is expected that the work will be pusned rapidly.

The Twentieth Century Heating & Ventilating Co., of Akron, O., will enlarge their plant by adding a new machine shop and foundry.

Work will be begun in a few days on the construction of a new plant for the United States Malleable Castings Co., Toledo, O. The company will manufacture castings for the National Supply Co. and several other Toledo concerns.

The foundry of the Eastern Indiana Foundry Co., in Losantville, Ind., has been nearly completed.

Hunt, Helm, Ferris & Co., Harvard, Ill., makers of agricultural implements, are planning to build a new foundry, 40 x 100 feet.

The Keystone Mfg. Co., of Sterling, Ill., are making changes which will very greatly increase the capacity of their plant.

The Galesburg Machine Works, of Galesburg, Ill., has completed a foundry which will be run in connection with its machine shop.

Beech Bros. will erect a foundry and machine shop at Charlotte, Mich.

The Garwood Foundry & Machine Co., Garwood, N. J., is building a new foundry at a cost of $10,000.

W. C. McFarland, of the Orange Iron Works, Orange, Texas, will erect a machine shop and foundry at Alexandria, La., to cost about $30,000.

The Miners' Foundry & Machine Products Mfg. Co., will erect a new foundry at El Paso, Texas.

A new foundry is being erected by the Hilles & Jones Co., Wilmington, Delaware.

The Missouri Pacific railway has decided to locate its new shops, to cost about $1,000,000, at Sedalia, Mo. The shops will consist of ten separate building to be built of iron and steel frames, and will cover about eleven acres of ground. When finished they will employ between 1,600 and 2,000 men. It is expected that a large proportion of the engines used on the system will be constructed in the locomotive department. One of the buildings will be a foundry.

The Murray Co., Dallas, Texas, manufacturers of cotton gin machinery, are planning to add a new foundry to their plant.

Gus Gille, of Joplin, Mo., is planning to start a new foundry at Yellville, Arkansas.

Springer & Lester, of 520 Chamberlain street, Knoxville, Tenn., will build an addition 20 x 26 feet to their foundry.

The officials of the Pittsburg Valve, Foundry & Construction Co., of Pittsburg, Pa., state that they will rebuild their plant which was recently destroyed by fire. Arrangements have been made by the company to fill important orders without delay.

The building of the new wheel foundry of the Pennsylvania Railroad Co., at South Altoona, Pa., at a cost of $1,000,000 has been completed and will be ready for operation June 1. The equipment will cost over $300,000. The foundry will have a daily output of 900 wheels.

F. E. Myers & Brother, Ashland, O., have let the contract for an addition to their foundry, which will be built at a cost of $3,000.

Mr. Ed. Rosche, of West Bend, Wis., has purchased two lots and will erect a foundry 24 x 48 feet.

The Texas & Pacific railroad has decided to build a brass foundry in connection with their plant at Marshall, Texas. The new building will be 40 x 80 feet.

The Downie-Wright Mfg. Co., of York, Nebraska, are preparing plans for a new foundry which will be equipped with a full set of modern labor saving devices.

GENERAL INDUSTRIAL NOTES.

The Eagle Foundry Co., of Salem, Mass., has been incorporated with a capital of $12,000. Alonzo H. Smith is president and treasurer.

The recently incorporated Torrance Malleable Iron Co., of Troy, N. Y., has purchased from the receiver the plant of the Torrance Iron Co., of that city. Mr. Fred V. Griesman is president and treasurer, Mr. William E. Woollard vice president, and Mr. Geo. L. French, secretary.

The plant of the Economy Foundry Co., Syracuse, N. Y., has been sold at sheriff's sale to the International Heater Co., of Utica, holder of a second mortgage for $11,555, the amount of the first mortgage.

The Brooklyn Foundry Co., at Brooklyn, N. Y., has been incorporated with a capital of $100,000. The directors are: Henry H. Hull, Rentfro B. Banton and Banton Moore, of Brooklyn.

The waterworks board of Auburn, N. Y., has awarded to the Warren Foundry & Machine Co., the contract for furnishing from 20,000 to 25,000 feet of 12-inch pipe. The Warren Co.'s bid was $22.60 per ton. The other bids were: United States Cast Iron Pipe Foundry Co., $22.70; Charles Miller & Son, Utica, $22.90.

J. R. McWare, of Lynchburg, Va., and W. T. Adams, Corinth, Miss., have purchased the Hood Machine Works, of Birmingham, Ala. The new name of the corporation will be the Birmingham Iron & Steel Co. They will continue in the general foundry business and in addition will make steel castings.

The Ironton Foundry Co.'s plant at Ironton, Ky., has been sold to Messrs. W. L. Brammer and M. B. Giberson, Muncie, Ind., who will place the plant in operation. The Ironton Disc Plow Co. has the plant leased until May and it is probable that after this date the plow company will erect a plant of its own.

The Atlanta Furnace Co., Atlanta, Ga., has purchased the plant and entire assets of the Moncrief Furnace & Foundry Co. and will continue the manufacture of the Moncrief warm air furnaces. The company will continue its heating, ventilating, and sanitary engineering and contracting business, as formerly, and by having its furnace and sanitary castings made in its own foundry, under the personal supervision of the designer, will be better prepared to do good work.

The foundry and brass works of James W. Carr, at Richmond, Va., recently damaged by fire, have been repaired and are again in operation.

The new plant of the Dixie Foundry & Machine Co., Bristol, Tenn., has been completed and all machinery installed so that it is now in a position to do a general foundry and machine business.

The concession held by Al. Bernard for the erection of smelting works and foundry at Guaymas, Sonora, Mexico, has become forfeited by his failure to commence work within a stipulated period.

The Acme Foundry Co., Brooklyn, N. Y., has been incorporated with a capital of $40,000. Directors are: J. L. White and John Warren, Brooklyn, and J. B. Davie, New York.

The Holland Machine Co., New York, has been incorporated with a capital of $25,000. Directors are: H. R. Marcellus, Brooklyn; N. W. Walton, Newark, and W. W. Mumford, New York.

At a meeting of the directors of the American Steel Foundries held in New York April 7, Joseph E. Schwab tendered his resignation as president to take effect April 16. The resignation was accepted and General Charles Miller was appointed president. Mr. Schwab is still a member of the executive committee and board of directors.

The Quintard Iron Works Co., New York City, have been incorporated with a capital of $250,000. Directors are: N. F. Palmer, G. Q. Palmer and F. F. Palmer, all of New York.

The Donaghy-Owens Foundry & Machine Co., of Pittsburg, has been incorporated with a capital of $10,000. The directors are: J. D. Owens, M. O. Owens, Charleroi; J. F. Donaghy, D. S. Donaghy, Coraopolis; E. M. Chidler, Pittsburg.

The Clowes Brass & Copper Corporation, of Elwood City, Pa., has been incorporated with a capital of $10,000. The directors are: Edwin L. Allen, Sewickley; Fred L. Roberts, Ralph L. Smith, Pittsburg.

The Crescent Brass Mfg. Co., of Reading, Pa., has been incorporated with a capital of $15,000.

Floyd, Wells & Co., of Roylesford, Pa., have been incorporated with a capital stock of $210,000. This is an old firm which will do business under a new name. They manufacture stoves and ranges.

The Standard Pulley Co., 524-526 East Fifth St., Cincinnati, O., recently incorporated, will manufacture cast iron pulleys exclusively. The foundry has a complete equipment for the manufacture of castings and finished pulleys. The daily capacity is about ten tons.

Through the Bullock Electric Co., of Cincinnati, O., the Allis-Chalmers Co. has acquired the Ballman-Wilson foundry of Cincinnati at a price approximating $100,000. This foundry has already been engaged in the manufacture of castings for the Bullock Electric Co., and the new arrangement brings the allied interests into closer touch.

The Bourbon Copper & Brass Works, of Cincinnati, O., has been incorporated by Thomas Ford, Peter N. Bardo, George Schick, E. M. Garrison and Albert Bettinger. Capital stock, $50,000.

The Sandusky Foundry & Machine Co., of Sandusky, O., has been incorporated with a capital of $50,000. The incorporators are: Sidney Frohman, G. A. Blackford, J. J. Dauch, W. F. Ross, E. B. Achley.

George Kinney has leased to the Hoeffinghoff & Laue Foundry Co., Cincinnati, for fifteen years. The company is given the privilege of purchasing the plant at the end of that time for $22,000. The annual rental is $1,100.

The Peru Steel Casting Co., Peru, Ind., has closed its plant for an indefinite period.

The Latchford Machine Co., Chicago, has been incorporated with a capital of $50,000, to manufacture machinery. Incorporators are: Joseph M. Griffin, Warren Nichols, Harry A. Warren.

The Marengo Foundry Machine Co., of Marengo, Ill., has been organized to succeed Kelley & Co., of the same place. The officers of the new company are: A. W. Kelley, president; G. A. Bennett, vice-president; W. E. Bardell, secretary; R. B. Willard, treasurer. The firm is incorporated with a capital of $20,000.

The Quincy Foundry & Novelty Co., of Quincy, Ill., has increased its capital stock from $30,000 to $40,000.

The Davison Foundry Co., Chicago, Ill., has been incorporated with a capital of $10,000. The incorporators are: T. S. Hogan, F. J. Hogan and J. H. Lally.

The Walton-Van Huffel Mfg. Co., of Galesburg, Ill., has been incorporated with a capital of $20,000 to do a general machine and foundry business. The incorporators are: M. S. Walton, Peter Van Huffel, W. P. Martin.

The Faribault Mfg. Co., Faribault, Minn., has been incorporated with a capital of $50,000, to manufacture machinery.

The Schmidtke & May Co., Sturgeon Bay, Wis., has been incorporated with a capital of $20,000, to manufacture machinery.

The Thompson & Sons foundry, in Beloit, Wis., which was almost totally destroyed in a recent flood and fire, will resume operations soon. The patternmakers are now constructing new patterns to take the place of those destroyed, so that there will be no delay in the work.

Geo. F. Smith & Co., machinists and foundrymen, are moving their plant from Holland, Mich., to Sturgis, Mich.

The Morrison Foundry Co., Newark, N. J., has been incorporated with a capital of $10,000. Incorporators are: James Morrison, Algernon T. Sweeney and Cassimire Scoppettone.

The Wake Forest Foundry Co., Wake Forest, N. C., has purchased the plant of the W. B. Dunn Plow Co.

The Harmony Grove Foundry at Commerce, Ga., has been sold to W. A. Gibbs, who will operate the plant.

The Pugh Foundry Co., of Kansas City, has been incorporated with a capital of $10,000. The incorporators are: Margaret S. Pugh, Warren Allen Pugh, Walter G. Pugh and Lucy Pugh.

The Grand Island Iron Works, of Grand Island, Neb., has been started by Messrs. Ballard and Chas. A. Brayton.

The pipe foundry of the Minnequa plant of the Colorado Fuel & Iron Co. resumed operations March 28. It was the first of all departments to close down because of the large stock on hand.

The Mexican Car & Foundry Co., of the City of Mexico, which was recently organized with a capital of $1,000,000 gold, has begun work on the construction of its buildings and the installation of machinery.

The Tabor Mfg. Co., of Philadelphia, Pa., have opened an office in Boston, in the Mason building, No. 70 Kilby street. The office is in charge of Mr. C. S. Lovell.

The McCaul Brass Foundry Co., of Chelsea, Mass., has been incorporated with a capital of $5,000. The incorporators are: President, Mary A. McCaul; treasurer, Patrick C. McCaul.

The new foundry of the Crescent Brass Mfg. Co., which is located in the old pattern shop of the P. & R. Co., in Reading, Pa., has commenced operations and the company is expecting to have a prosperous time.

The Morrison Brass & Iron Foundry Co., of Youngstown, O., are putting in equipment to make light hardware, brass and bronze castings, as well as the heavy mill bronzes and brasses which are their specialty.

The Chandelier and Art Brass Works, of Richmond, Ind., held their annual meeting recently and elected the following board of directors: Judson R. Rupe, W. H. Campbell, Henry C. Teeter, S. W. Gaar, Sharon E. Jones, H. L. Ashley and Oscar C. Smith. Mr. Rupe is president, Mr. Campbell vice president, Mr. Smith is secretary and Mr. Gaar treasurer. They have also decided to increase the capacity of their plant.

The general offices of the Republic Iron & Steel Co., at Chicago, have been removed to the First National Bank building, corner Monroe and Dearborn streets.

C. W. Thomas, successor to the Michigan Brass & Iron Works, of Detroit, Mich., is sending out a circular letter to correct a false impression which seems to be abroad as to the ownership of the Michigan Brass & Iron Works. The new company will carry on all of the lines carried on by the old company, and have purchased all of their plant and equipment, so that they are in a position to furnish duplicates of anything which the old company have supplied. They will be glad to furnish material either to their old customers or to new, and have several catalogues covering the different lines which they manufacture.

W. E. Brown and E. D. Ellsworth have leased the property of the Michigan Iron Works at Manistee, Mich., and will manufacture cast iron molds for making cement building blocks. They were formerly engaged in this business at Union City, Mich., and are now moving their machinery from Union City to Manistee.

The Henry R. Worthington Hydraulic Works, Brooklyn, are to be removed to the new $2,000,000 plant of the International Steam Pump Co., at Harrison, N. J. The company has also disposed of its large foundries at Elizabethport, N. J.

M. B. Blair, formerly manager of the Parkersburg Casting Co., Parkersburg, W. Va., will engage in the foundry business for himself at New Martinsville, W. Va.

The Birmingham Iron & Steel Co., which recently purchased the plant of the Hood Machine & Foundry Co., has begun the conversion of the property into a steel casting plant. J. R. McWane, formerly of Richmond, Va., is general manager.

The McArdle-Parker Machine Co., of Birmingham, Ala., has been incorporated with a capital of $50,000. The incorporators are: P. H. McArdle, of New Orleans; F. W. Parker, of Birmingham; George St. Paul, of New Orleans, and others.

The buildings which the United States Malleable Iron Co., Toledo, O., is erecting will cover about 32,000 sq. ft. consisting of foundry, pattern storage and office building. At the present time concrete foundations are being put in place.

THE PATTERNMAKER

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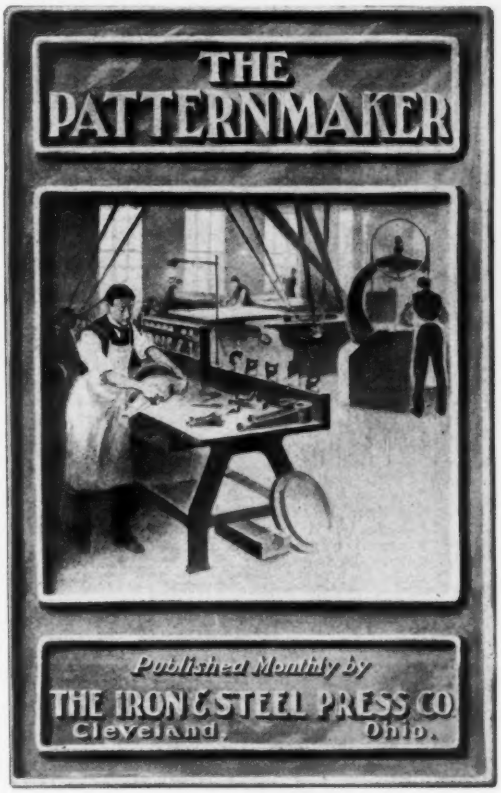

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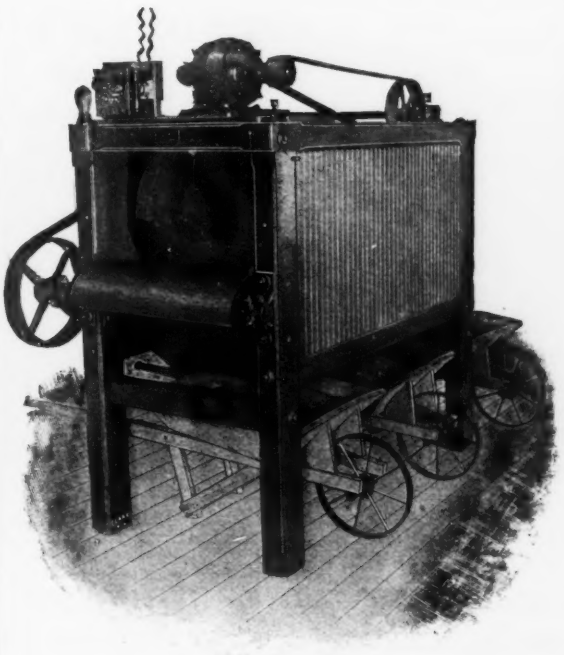

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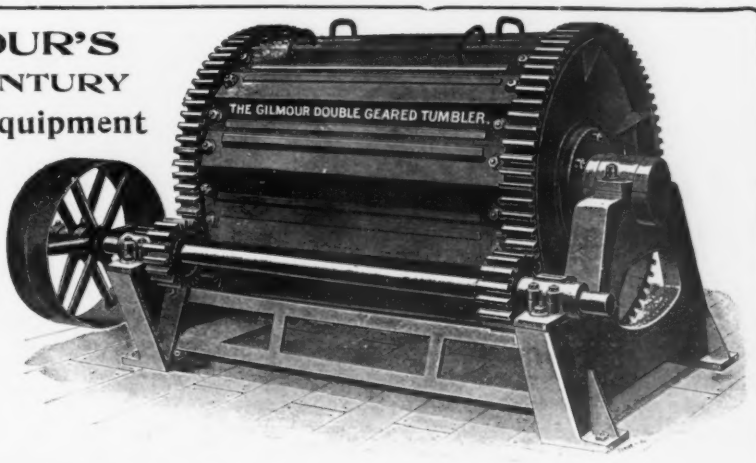

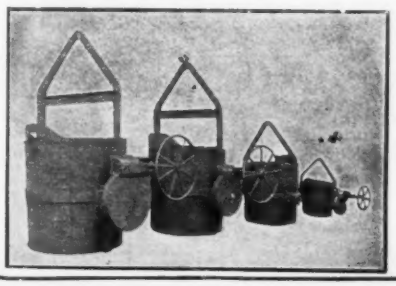

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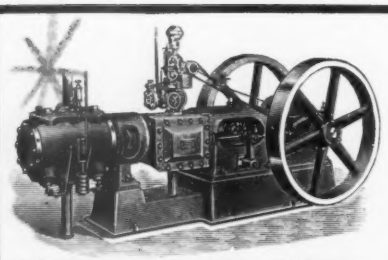

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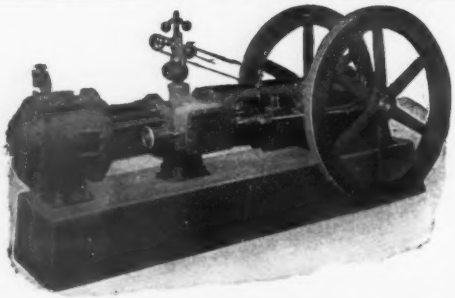

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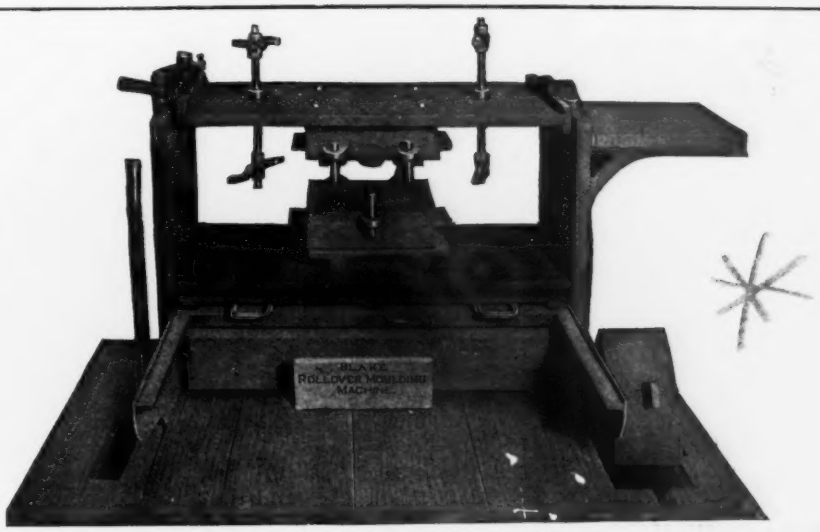

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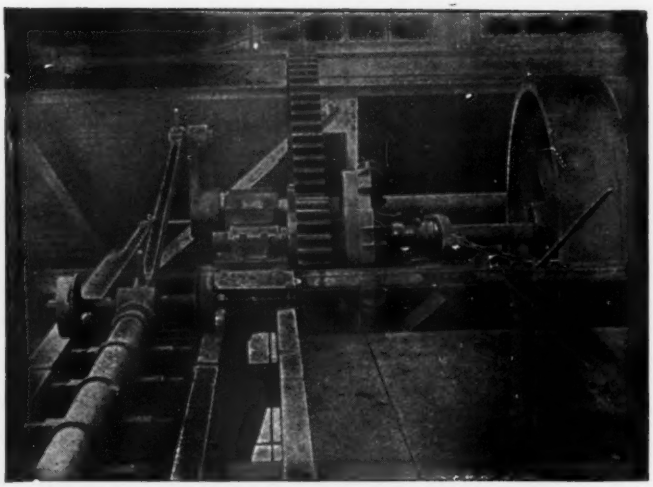

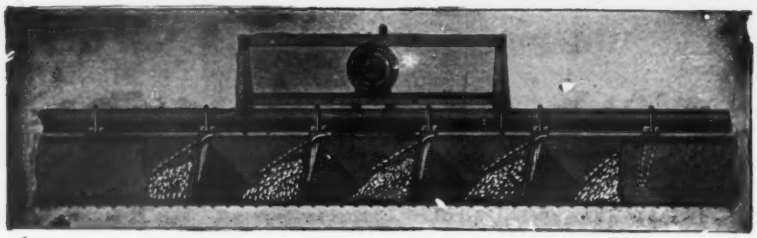

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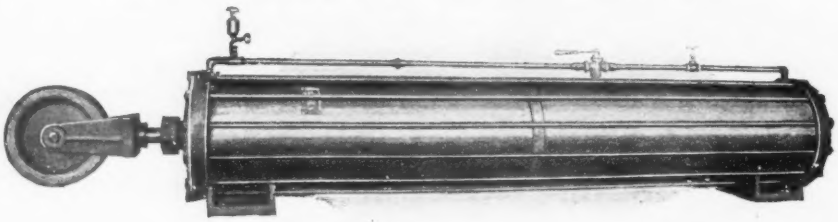

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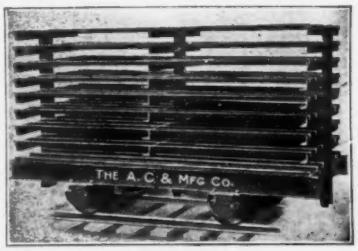

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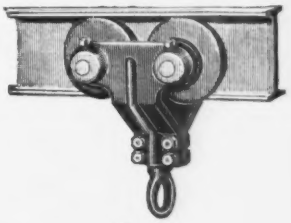

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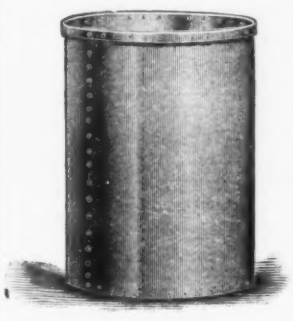

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¶ Mr. F. C. Brooksbank also announces that he has severed his connection with Messrs. E. T. Ward & Sons, Boston, Mass., and is now associated with the Tilghman-Brooksbank Sand Blast Company, 409 Commerce St., Philadelphia, Pa., where as general manager any communications to the above company will receive his personal attention.

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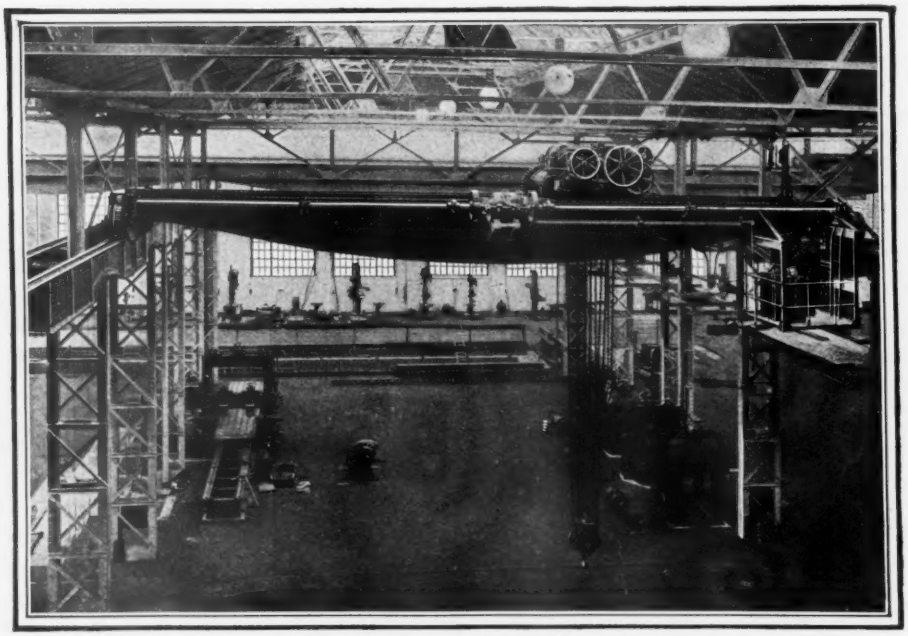

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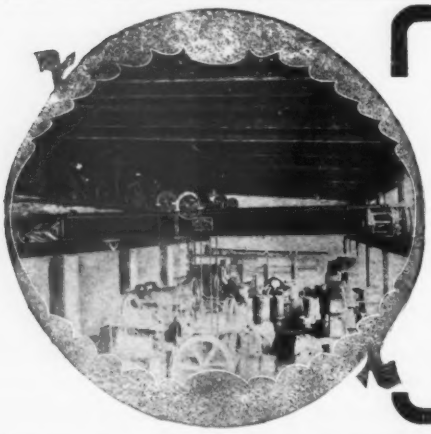

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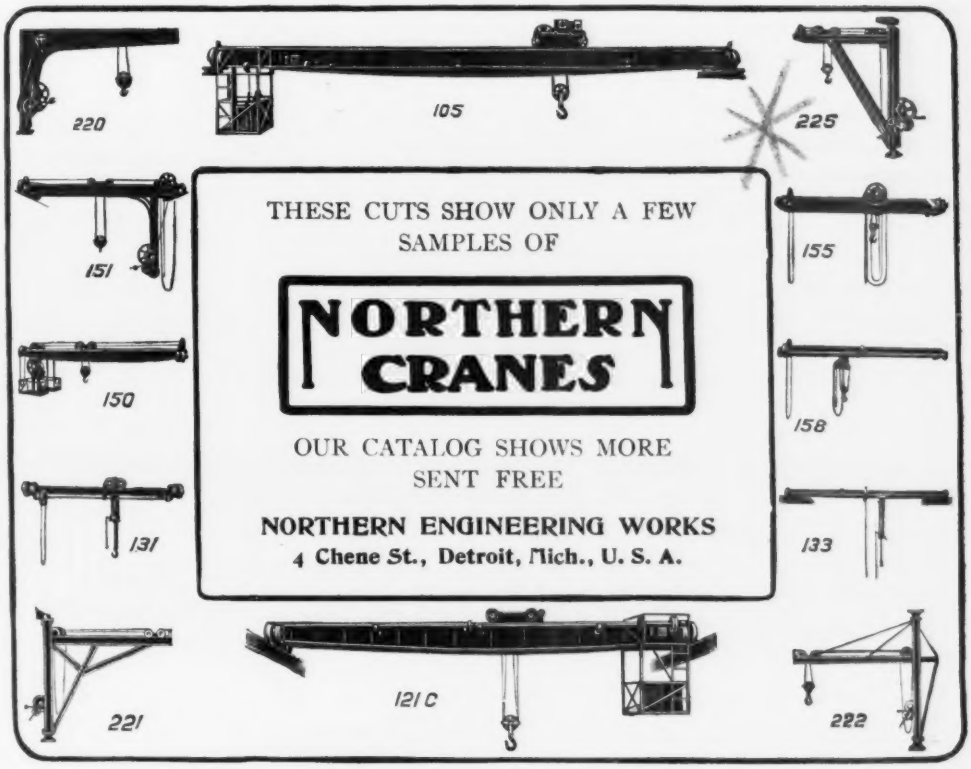

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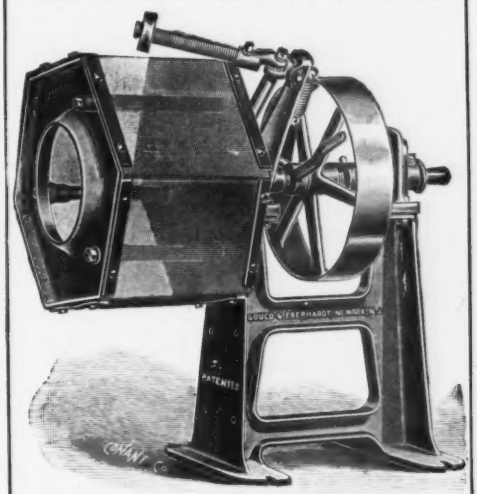

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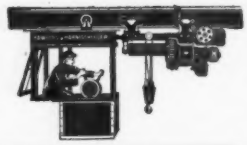

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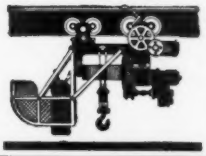

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	Pcs.	Avg. Lbs.	Pcs.	Avg. Lbs.	Pcs.	Avg. Lbs.	Pcs. Avg. Lbs.
	Amt.	Avg.	Amt	Avg.	Amt.	Avg.	
METAL: Pig Iron							
Iron. Loss							
Rod C. Loss							
Sales & Scrap							
Melting							
Total							
DIRECT CHGS.: Molding Sand							
Core Sand							
Brick							
Acct. Castings							
Core Oven							
Total							
LABOR: Molding							
Coremaking							
Direct Labor							
Cleaning							
General Labor							
Total							
CHARGES: Machine Work							
Belt. Loss							
Spec. Expenses							
General Charges							
Molds							

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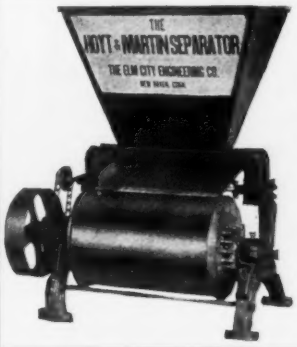

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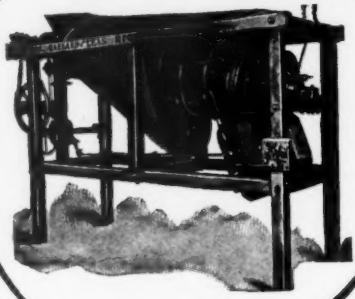

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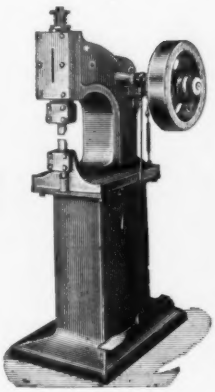

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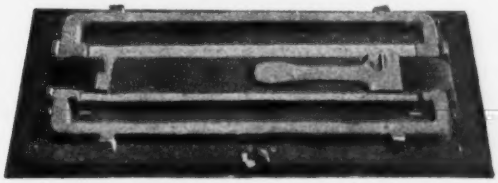

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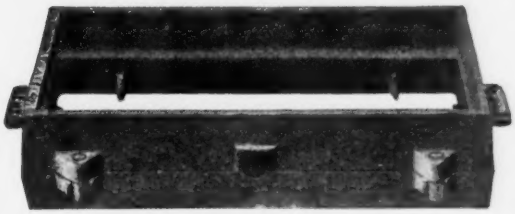

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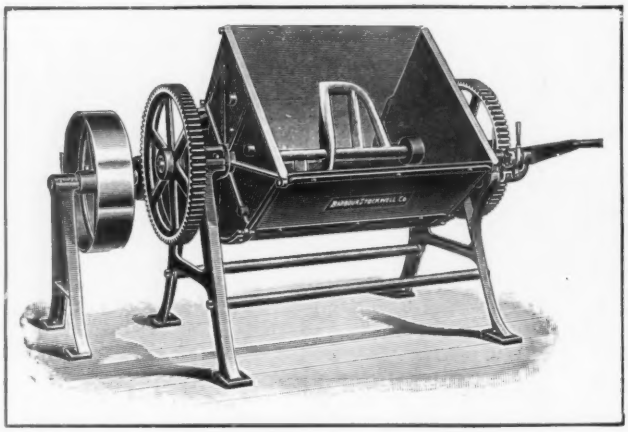

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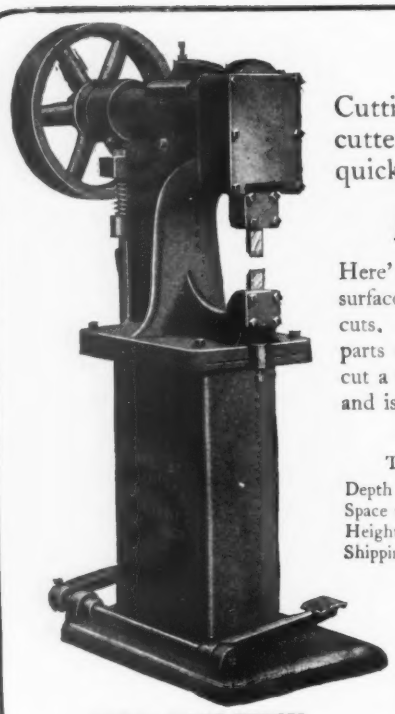

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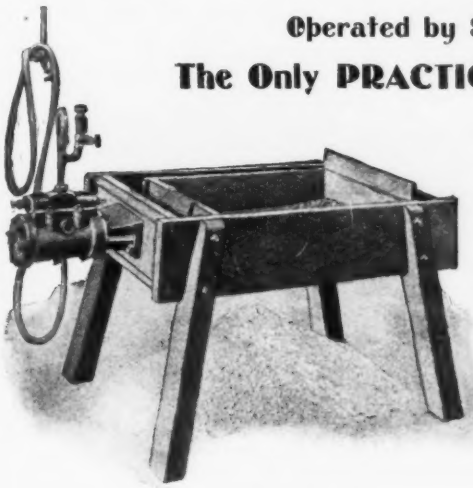

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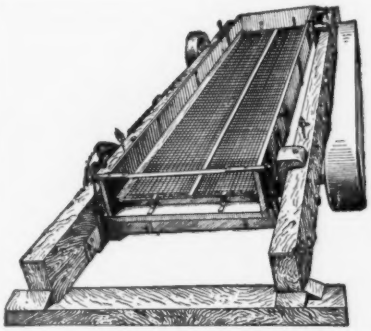

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